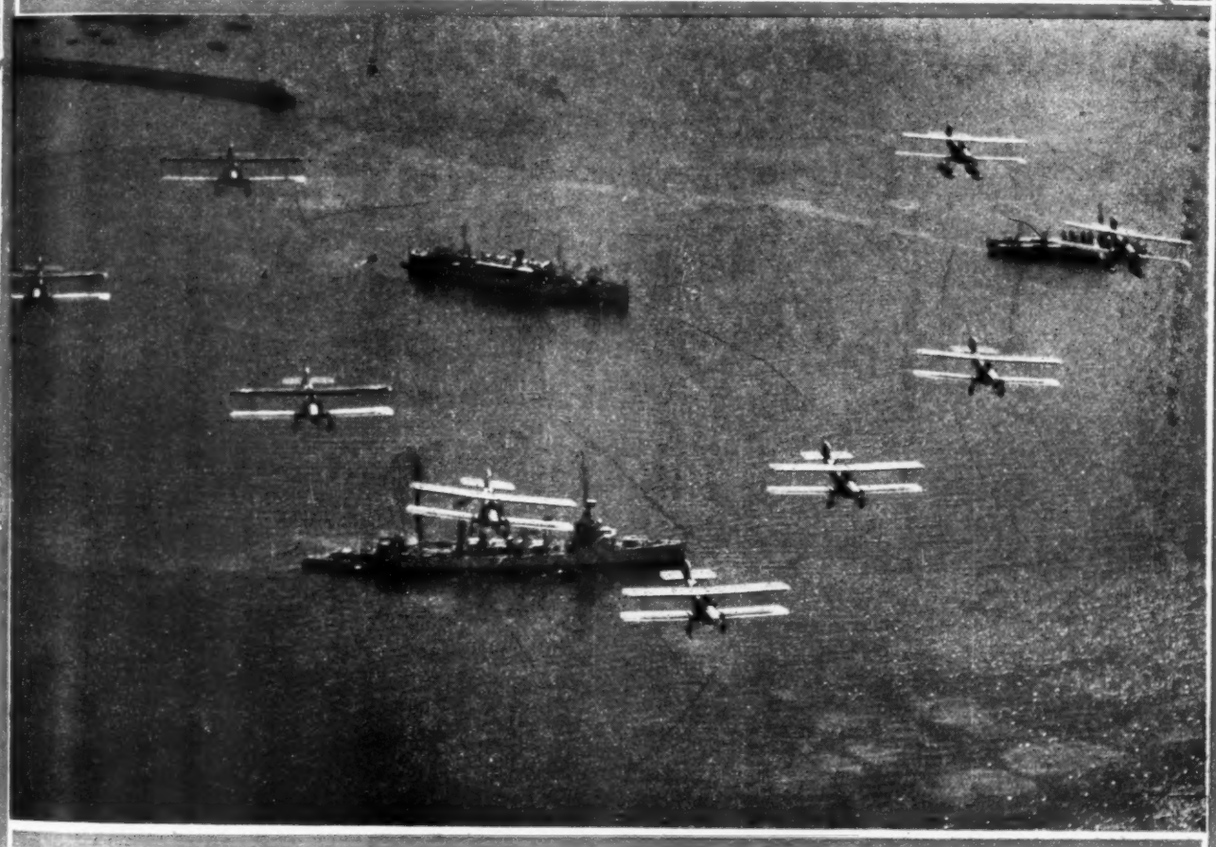
TECHNICAL DEPT.

# AVIATION

*The Oldest American Aeronautical Magazine*

APRIL 23, 1928 | Issued Weekly | PRICE 20 CENTS



Formation of Navy planes passing over the *U.S.S. Omaha* in San Diego Harbor.

VOLUME XXIV

NUMBER 17

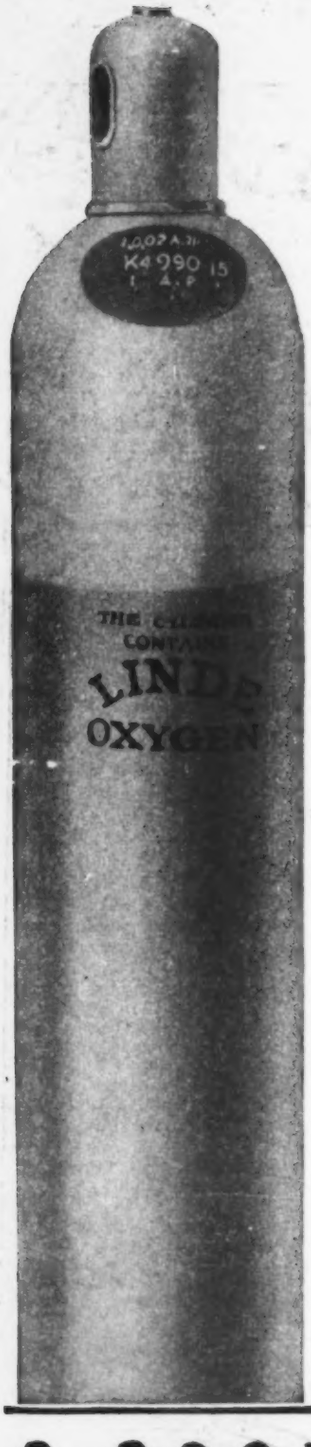
## *Special Features*

**Potomac Flying Service, Inc.**
**Airplane Dopes and Their Application**
**German Plane Crosses North Atlantic East to West**

AVIATION PUBLISHING CORPORATION
250 WEST 57 STREET, NEW YORK

Publication Office, Highland, N. Y. Entered as Second-Class Matter, Nov. 22, 1920, at the Post Office, at Highland, N. Y. under Act of March 3, 1870.

TOLEDO PUBLIC LIBRARY




# There must be a good reason why

Linde Oxygen is the largest selling oxygen on the market.

There is.

Linde customers get more for their money.

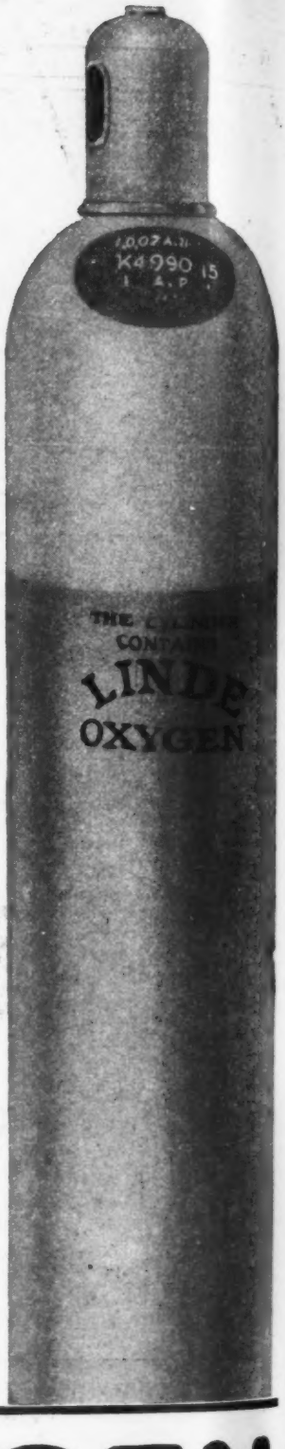
They get a good product, immediate delivery, and Linde Process Service that insures economical results.

THE LINDE AIR PRODUCTS COMPANY
*Unit of Union Carbide and Carbon Corporation*

UCC

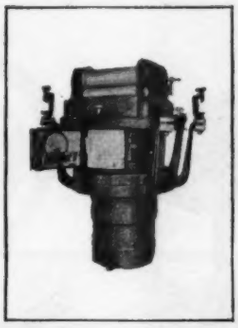
*General Offices:* Carbide and Carbon Building
30 East 42d Street, New York

48 PLANTS . . . . . 105 WAREHOUSES



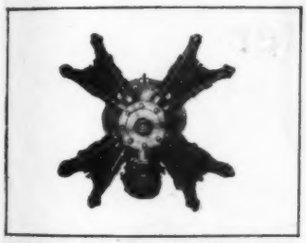

# LINDE OXYGEN

THANK YOU *for mentioning* AVIATION

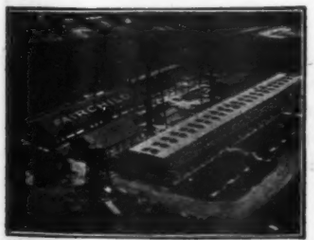


*FAIRCHILD AERIAL CAMERA CORPORATION, pioneers and largest manufacturers of aerial cameras.*

*FAIRCHILD AERIAL SURVEYS, Inc., contractors for aerial maps and oblique pictures; branches, Dallas and Los Angeles.*



*FAIRCHILD-CAMINEZ ENGINE CORPORATION, manufacturers of advanced types of air-cooled engines.*



*FAIRCHILD AIRPLANE MFG. CORPORATION, manufacturers of folding-wing cabin monoplanes and metal floats.*

**THE FAIRCHILD AVIATION CORPORATION** was formed for the purpose of organizing, financing and managing a group of subsidiaries in both the manufacturing and operating fields of aeronautics.

Today there are eight subsidiaries, each a distinct and complete organization in itself, but at the same time profiting from the centralized management and guidance of the parent company and the friendly co-operation from all of the other subsidiaries.

For nearly eight years the name Fairchild has been synonymous with the utmost in accuracy and reliability of aerial products. It is, therefore, only natural that the Fairchild Aviation Corporation will endeavor to maintain its enviable position of leadership in the field of quality aviation products.

**FAIRCHILD AVIATION CORPORATION**
**270 West 38th Street - - New York**

*FAIRCHILD FLYING CORPORATION, operators of airplanes for photographic and aerial taxi work.*

*In Canada: FAIRCHILD AVIATION, Ltd., aerial surveying for large timber interests and air transport work.*

*In Mexico: COMPANIA MEXICANA DE AVIACION, S. A., operators of airplanes for passenger and express transport from Tampico.*

# FAIRCHILD

WACO - TEN
RYAN SIEMENS

# What WACO Shows
## . . . others will eventually offer

WHEN A PRODUCT leaps into prominence, through unusual performance, and continues growing in favor month after month, year after year, it surely must offer unique qualities and values.

The air-minded, are recognizing more and more how WACO engineering and production methods are *constantly leading the way.* How refinements and improvements are *first* given the public, as standard equipment on WACO planes.

*Approve type certificates Numbers 11 — 13 — 26*

WACO was *first* to offer — complete production planes at moderate prices — all steel fuselages — center sections — enclosed cowls — dual controls — side door and wing step — adjustable stabilizer — quick take off — fast climb — slow landing speed — high top speed.

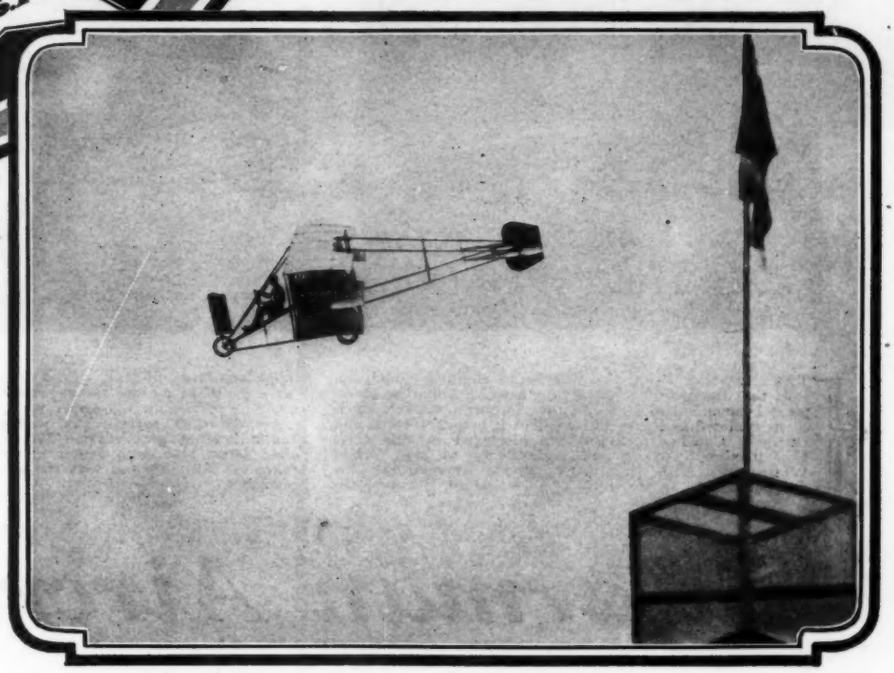
*Now* WACO pioneers, with the quantity production of airplanes utilizing new type motors. WACO engineers have developed the super structure of the WACO TEN to take full advantage of Whirlwind — Ryan-Siemens — Caminez and OX5 motors. This wonderful plane — the acknowledged leader in its class — now gives more performance and is more dependable than ever.

WACO offers CHOICE OF FOUR MOTORS — a wonderful range of performance —a price field to satisfy everyone.

WACO AIRPLANES

ADVANCE AIRCRAFT COMPANY
TROY OHIO

Glenn L. Martin winning the Grand Derby at National Meet, Cicero Field, Chicago, Illinois, July, 1913.



EXPERIENCE Eighteen years of specialization, dating back to the first beginnings of the art of aeronautics, has taught the Glenn L. Martin organization how to accomplish, on a production basis, jobs which other experts assured us "couldn't be done" —an asset of inestimable value in building today's planes and perfecting the aircraft of tomorrow.

THE GLENN L. MARTIN COMPANY
*Builders of Quality Aircraft since 1909*
CLEVELAND, OHIO

THANK YOU *for mentioning* AVIATION

THE STEARMAN C-2B, the Whirlwind engined model, enjoys the distinction of being the most outstanding three-piece commercial airplane on the American market. It is so streamlined and proportioned that it bespeaks speed and stamina. Cowling arrangements displayed in this craft give maximum power and accessibility to the Wright Whirlwind engine. Indeed, the Wright Aeronautical Corporation highly recommends our installation. Back of the engine is a large oil tank, with a capacity of five gallons—plus a generous margin for expansion. The main gasoline supply is carried in the upper wing, thus increasing passenger or mail space. The sturdy Stearman *Rubber-draulic* landing gear carries 30 x 5-inch tires on neatly faired latest type drop center rimmed wheels. Powerful brakes are built integral with the wheels and are standard equipment.

# *Stearman Aircraft*

are built with the conviction that economy in the operation of an airplane is fundamentally a matter of ultimate cost per flying hour, and that while these hours are accumulating the pilot and passenger should have every convenience and comfort within the limits of feasibility.

THE STEARMAN will carry 400 lbs. pay load with a fast cruising speed, a high speed with reserve power.

THE STEARMAN is equipped for both day and night flying.

THE STEARMAN has *proven* a dependable ship, having maintained a wonderful schedule in the air mail service under all adverse weather conditions. The standard equipment of two prominent contract air mail operators is now predominantly STEARMAN.

PRIVATE OWNERS AND PILOTS will approve of the maneuverability of this plane and the fine appointments which are selected to satisfy the most critical taste.

AIR LINE OPERATORS will find that this plane meets with all their requirements—accessable—sturdy—slow landing—high speed—*proven* low maintenance cost.

CORPORATIONS desiring to keep step with the progress of the times will find the STEARMAN a comfortable, dependable, efficient airplane for transporting personnel and express to distant places.

ANY ONE OF OUR FOUR OFFICES will be glad to assist you in determining the adaptability of the STEARMAN to your requirements.

*Let Us Send You Detailed Information*

**603 Bedell Bldg., Portland, Ore.** — **226 Noble Bldg., Boise, Idaho**

U.S. Varney air lines MAIL

**904 White Bldg., Seattle, Wn.** — **310 Balboa Bldg., San Francisco, Calif.**

ASK THE PILOT WHO FLIES ONE

# AVIATION

*The Oldest American Aeronautical Magazine*

EARL D. OSBORN, *Publisher* — R. SIDNEY BOWEN, JR., *Editor*
LESTER D. GARDNER, *Director* — RICHARD M. MOCK, *Technical Editor*
GEORGE NEWBOLD, *Business Manager* — HERBERT F. POWELL, *News Editor*
ALBERT F. MULLADY, *Asst. Business Manager* — DAVID J. LEISK, *Art Editor*

Vol. XXIV *April* 23, 1928 No. 17


## Index to Contents


EDITORIALS ..... 1145
POTOMAC FLYING SERVICE, INC. ..... 1146
WING ANALYSIS ..... 1148
AIRPLANE DOPES AND THEIR APPLICATION 1149
GERMAN PLANE CROSSES NORTH ATLANTIC EAST TO WEST ..... 1150
NEWS ..... 1151 TO 1156
LAST MINUTE BRIEFS ..... 1154
SIDE SLIPS ..... 1168
FOREIGN NEWS ..... 1169
AIRPORTS AND AIRWAYS ..... 1170
U. S. AIR FORCES ..... 1178



**AVIATION PUBLISHING CORPORATION**
*Business and Editorial Offices*
**250 West 57th St., New York City**
*Cable Address:* AEROENG
*Publication Office: Highland, New York*

*Subscription price: Four dollars per year. Canada, five dollars. Foreign, six dollars. Single current copies, twenty cents. Back numbers, 25 cents. Advertising rates on application. Issued every Monday. Forms close ten days previously. Entered as second-class matter Nov. 22, 1920, at the Post Office at Highland, N. Y., under act of March 3, 1879.*

*Copyright 1928 by Aviation Pub. Corp.*

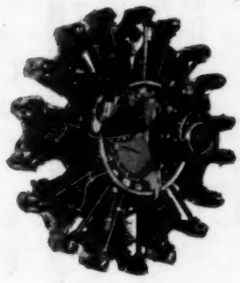
*For Your Convenience in Subscribing*

**Please send AVIATION to**

.....
.....
.....

**Enclosed find check ( ) money order ( ) for $....**

The Stearman Biplane, powered with a 200 hp. Wright Whirlwind Engine



equipped with

**SCINTILLA**

*Aircraft Magnetos*

**SCINTILLA MAGNETO COMPANY**
**SIDNEY, NEW YORK**

***Contractors to the U. S. Army and Navy***

BYRD, BENNETT — SPITZBERGEN TO NORTH POLE AND RETURN — CHAMBERLIN, ACOSTA — ENDURANCE FLIGHT 51 hrs 11.30 min. App 4100 Mi. — LINDBERGH — SAN DIEGO - ST. LOUIS - NEW YORK 2400 Mi. NEW YORK - PARIS 3600 Mi. — CHAMBERLIN, LEVINE — NEW YORK to EISLEBEN GERMANY 3905 Mi. — BYRD, ACOSTA, BALCHEN — NOVILLE — NEW YORK to VER SUR MER FRANCE App. 4000 Mi. — MAITLAND, HEGENBERGER — OAKLAND CAL. to WHEELER FLD. HAWAII 2400 Miles — SMITH, BRONTE — OAKLAND CAL to MOLOKAI ISL HAWAII 2348 Miles — LINDBERGH — U.S. TOUR 22,350 Miles — GOEBEL, DAVIS — OAKLAND CAL. to WHEELER FLD HAWAII 2400 Miles — JENSEN, SCHLUTER — OAKLAND CAL. to WHEELER FLD HAWAII 2400 Miles — BROCK, SCHLEE — HARBOR GRACE ME. to TOKIO JAPAN 12,295 Miles — GEORGE HAL, DEMAN, RUTH — ELDER — ATTEMPTED TRANSATLANTIC FLIGHT 2574 Miles — LINDBERGH — PAN-AMERICAN TOUR - 7860 Mi. NEW YORK - MEXICO CITY - 2000 Mi. — RUTH, NICHOLS — MAJOR K.M., LEE, HARRY — ROGERS — NEW YORK to MIAMI FLORIDA 1100 Miles — MAJOR L., BOURNE, LIEUT, J. F., PLACHTER, SERGEANT — BELCHER, ANACOSTIA to MANAGUA NICARAGUA 2050 Miles — MIAMI TO NICARAGUA NON-STOP 1200 Miles — G.C. TOWNER, LT., B. McHUGH, LT. JAMES, RBT. WENE, CORPORAL — WILMER, ANACOSTIA TO MIAMI 850 Miles — MIAMI to MANAGUA NICARAGUA 1200 Miles — C. A., STULTZ — NEW YORK TO HAVANA 1600 Miles — LEVINE, MABEL BOLL


JN these still early chapters of aeroplane development, the Wright Whirlwind Engine is writing its own history.

From Byrd's trip to the North Pole in 1926 through Lindbergh's flights and on to the records made within the last few weeks, the performance of Wright Engines has been startling enough to sound its name in the ears of the peoples throughout the world.

WRIGHT AERONAUTICAL CORPORATION

*Paterson, N. J.* *U. S. A.*

CANADIAN WRIGHT LIMITED, Sole Licensees for Canada, Montreal

**WRIGHT Whirlwind engine**

A SUPERLATIVE AERONAUTICAL

That's why More Pilots fly them!

A sectioned Whirlwind Engine will be one of the features at our booth in Convention Hall at the All-American Aircraft Show, April 14-21, Detroit, Michigan.

AVIATION

*The Oldest American Aeronautical Magazine*

Vol. XXIV | *APRIL* 23, 1928 | No. 17

## Jockey Pilots

PURSUIT PLANE designers devote countless time and effort in refinements in design which will save a few pounds of weight and will cut off a few inches from the frontal area of the plane. Yet, while doing all this they realize that they must design their plane to fit a man who is over six feet tall and who may weigh over two hundred pounds in his flying equipment and parachute. The answer seems obvious; cut down the size and weight of your pilot and you can do more than you can by any amount of refinement in design. For a certain kind of high speed pursuit plane the air forces should undoubtedly start recruiting and selecting pilots who have the same general characteristics as our race track jockeys.

The English have recently given a most interesting demonstration of what could be done along this line. The de Havilland Company designed its Tiger Moth using as the cross section outline of their fuselage the smallest dimension into which could be fitted a very small but excellent pilot. The company used a four cylinder in line air-cooled engine of only 130 hp. This is less than one-third of the power of most pursuit planes, yet both in high speed and in climb the plane equalled or exceeded the performance of any standard pursuit plane.

Our Army regulations now prescribe minimum height and weight requirements for enlistment. It may be at a not very distant date that the requirement for enlistment in the crack branch of our Air Corps will be a maximum instead of a minimum size. The development of a group of "Jockey Pilots" whose especially designed planes could outspeed those of any other part of the pursuit group would undoubtedly take a long time to develop but they would prove invaluable for reconnaissance in the enemy's territory and even though their armament were limited to one gun they would have a real offensive power.

## Manufacturing Costs

ONE OF the interesting and curious features of the present day airplane manufacturing situation is that apparently the cost of the planes is not going down in proportion to the increase in production. Exclusive of engines, planes are as expensive as they were a few years ago, yet the number built has increased tenfold. Those who know, say that this is not due to undue profits on the part of the manufacturers, but rather to conditions inherent in the manufacture of airplanes as built at present.

When airplanes built for commercial purposes first began to compete with the war surplus stock they were built in the back yard, so to speak. Only the simplest machinery was needed, and a good carpenter and welder could turn out an excellently finished plane. The designer was also a test pilot, shop foreman and salesman, so there was practically no overhead. There were no dealers, so less had to be given out in commissions and many of the sales were direct. Due to the competition of the cheap War surplus planes the sale price had to be very low and the builder of the plane was lucky if he made enough to keep himself going and paid himself a small salary. Had it not been for the War surplus competition the price would have started higher.

At present the manufacturer has to hire engineers and draftsmen, shop superintendents and stock room clerks. He has to design and build jigs and to rent a real factory. His dealers' commissions and his sales expenses have gone up greatly. In other words the direct labor cost may have gone down with production, but apparently the increase in overhead has just about counterbalanced this decrease. At what point increased production will allow of a real decrease in price to the consumer is hard to tell.

In many ways the situation is satisfactory as far as the development of aeronautics goes, for it means that a brilliant designer can bring out a new design, and get a start without an enormous financial backing. The manufacturers who have already reached a considerable production will, however, have an enormous advantage and as in other industries they will gradually forge ahead and the small producer will drop out of the picture. With the gradual perfectioning of metal planes which lend themselves to production methods this initial advantage will gradually be accentuated and once really large production is reached it will be as hard to break into airplane manufacturing as it is to break into automobile manufacturing at the present time.

## Air Transport Advertising

IT IS to be admitted that the greatest selling point as regards air transportation is the item of speed, but at the same time air transport operators who are catering to passengers should bear in mind, when mapping out advertising campaigns, that there are other sales items of almost equal importance.

For the one who has yet to take his first ride in an airplane there awaits an experience that cannot be equaled by any other means of transportation. The beauty and interest of the ever changing panorama below him is something that he will remember for a long time to come. It has often been stated that the equal of all the beauties of Europe can be found within the borders of the United States. To view them from the best vantage point—the air—is a sales lure that can be well used in air transport advertising.

# Potomac Flying Service Inc.

## Washington, D. C. Company Has Flown 15,000 Sight-Seeing Passengers Within Six Months of Its Organization

By AARON M. ROSENBLEET

FIFTEEN THOUSAND sight-seeing passengers within six months of its organization is the record of the Potomac Flying Service, Inc., Washington, D. C. Within that period the company's flying equipment increased from two to six planes including two four-passenger planes and the personnel increased from two pilots and one mechanic to five pilots, four mechanics, business manager, stenographic secretary, bookkeeper, two solicitors and a special ticket collector and passenger escort. This record was achieved not by hair raising stunts and publicity but by the utilization of sound methods and principles which proved their worth and value in other commercial fields.

The Potomac Flying Service is located at Hoover Field, South Washington, Va., only twelve minutes ride from the heart of the National Capital. Henry A. Berliner of the Berliner Aircraft Co. is president of this company. The other officers of the concern are: Lowell S. Harding, vice president and general manager; Andrew H. Nash, secretary, and John D. Smoot, treasurer. Mr. Nash also acts as publicity man and advertising manager. The company is engaged in sight-seeing and cross-country flying, rents planes for photographic work and also manages a flying school with an average enrollment of 25 students.

### No Spectacular Advertising

When Mr. Nash was asked by what means the company achieved the record, as far as statistics are available, of carrying the largest number of sight-seers flown by any aviation organization he gave credit to the policies set down by the organizers of the concern.

"The company has established itself by adherence to conservative policies and sound business methods," he stated. And then he continued with his explanation.

"No spectacular advertising has been resorted to; it has never held an air circus or stunts in an effort to attract passengers or publicity. Planes have never carried passengers except under favorable weather conditions and the passenger flights have been conducted without steep banking, climbs or glides. By pursuing this policy the company has had no accident and due to the careful maintenance of its planes and the selection of its mechanics and pilots this enviable record should continue."

That statement gives only the general policies of the Potomac Flying Service. To find the specific principles whereby these policies were carried out and brought such astounding results, a careful analysis must be made of the methods used in attracting trade.

Washington is one of the leading sight-seeing and show places of the United States. Thousands of tourists either independently or under the guidance of tourist agencies come weekly to Washington. The problem with the Potomac Flying Service, was what means to use to acquire the tourist trade.

A scientific analysis was made of the itinerary of a tourist in Washington. Every contact made by tourists in Washington was studied, and the following was discovered.

The visitors to Washington come in contact with the representatives of their tourist agency, hotel clerks, sight-seeing bus and taxi drivers, news-stand agents, restaurant cashiers, and souvenir store-keepers. It was also found that tourists hardly spend any time reading newspapers and when they do buy a paper it is only to scan the front page and possibly the society page to glance at the "society doings" of the diplomatic corps. The tourist's aversion or impatience to read the newspaper and also the terrific expense of daily advertising in five newspapers eliminated that medium as a means to reach them with the message "to see Washington from the

Fly Over Washington!
$3.00 a flight
Longer flights at proportional rates
Aerial Photography Aerial Advertising Instruction
Potomac Flying Service, Inc.
Hoover Field, South Washington, Va.
Telephone Main 2331
On the Virginia bank of the Potomac, opposite the Lincoln Memorial

*Type of card advertising used effectively by Potomac Flying Service, Inc.*

air." It was then decided to use more direct means of advertising, that were certain to reach the attention of tourists and visitors to Washington.

Before this decision was carried out into effect the Potomac Flying Service did only a Saturday-Sunday business with an average of 200 passengers for both days. During week days there was a dribbling amount which at times hardly paid for the warming up of the engine, the pilot's time and fuel.

As soon as the new policy of reaching the tourist was begun to be carried out the effect was almost immediate. An example taken at random from one Wednesday to another shows the effect of the scientific analysis of the particular problem in Washington and which can be applied in any American city of any size:

Wednesday, 82; Thursday, 79; Friday, 48; Saturday, 110; Sunday, 106; Monday, 193; Tuesday, 10 (adverse wind nearly the whole day); Wednesday, 189. This makes an average of 102 per day, a figure which would please many an airport manager when it is considered that a ride means three dollars per passenger.

The campaign to divert the steady tourist flow to Hoover Field was divided into three parts; direct printed advertising, personal contacts and newspaper publicity.

*Direct Advertising:* It was found that of the show places of Washington two are never missed by a tourist. They are the Bureau of Engraving and the Arlington National Memorial. An artistic leaflet beautifully colored in sky blue with an orange base showing the Washington Monument and the National Capitol on the outside with a write-up on the inside was drawn up by a special commercial artist to immediately attract the eye, arouse interest and create a desire to find out the leaflet's message.

"From the very inception of our advertising campaign we decided," Mr. Nash said, "to make every effort to send out

*Reproduction of a flight ticket. Note perforations on the left side.*

only that type of advertising which will be attractive to the eye. Ugly advertising matter only drives people away. Cheap looking material means a cheap concern. The layout and the art work for the leaflet cost us $250 and is one of the best investments we made."

On the inside of the leaflet is a picture of the Arlington Amphitheatre from the air and also an air photograph of the Capitol. The reading matter is a persuasive appeal to the reader to see the beauties of Washington from the air. It also contains the record of the company, mentioning its policies as to care in selection of its personnel and safety in flying. Set off with a thin orange border is the picture of the "Flying Certificate" which forms a part of the flight ticket and is left with the passenger as a memento of the air voyage over the city of Washington.

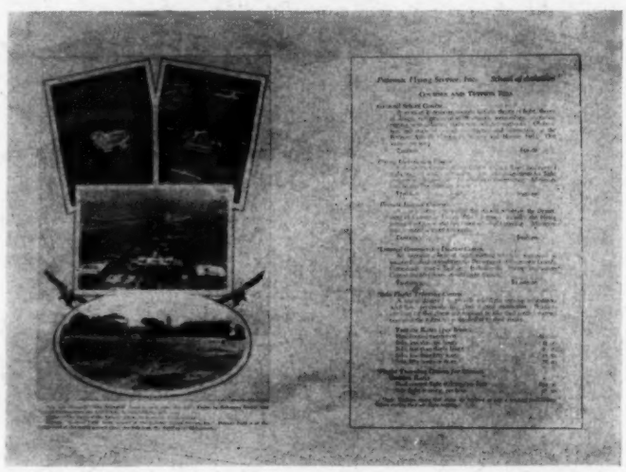
### Tickets in Books of 50

The flight tickets are made up of clouded blue paper with a gold figure of an airplane and the wings which are the emblem of the Potomac Flying Service. The tickets are in books of 50 and are numbered serially. These ticket books are distributed among the tourist agency offices, hotel clerks and newsdealers—all responsible persons. When a ticket is sold the stub is left in the book, which then serves as a guide to indicate the number of tickets sold by that particular agent. The second part of the ticket is kept by the pilot which he hands in at the end of the day and serves as a guide for his pay and commission. The number of perforations that the pilot makes on his part of the ticket indicates the number of passengers who went up on a trip. The third part is the "Flight Certificate" which states that so and so has made an air voyage over the city of Washington. The printed signature of the general manager is at the bottom on one side while the printed words, Hoover Field, South Washington, Va., are at the bottom on the other side. On top of the certificate are the spread wings of the Potomac Flying Service with a monoplane in gold colors in the middle, all of which makes a very artistic effect on the clouded blue paper and a memento which is actually worthwhile keeping.

Mr. Nash mentioned that visitors often came from all over the United States with the "Flight Certificates" their friends brought home with them and asked to be taken up so they too could show a flight certificate like that when they return.

The picture of the flight certificate on the leaflet brings many tourists to the flying field, and to make certain that they will not lose their way a diagram is drawn on one side of the leaflet to show the visitors how they can reach the field by either bus or trolley. On the same diagram a circle is drawn in gold showing the points of interest the plane flies over when making a trip, which includes the Lincoln Memorial, Washington Monument, White House, Museum, the heart of Washington, Potomac Park and Arlington.

Every day two solicitors are sent out with a thousand leaflets each to distribute them at the Bureau of Engraving and Arlington. The leaflets are also distributed among the tourist offices, theatre selling agencies, hotel desks, news stands, restaurants and sight-seeing buses. To make certain that the leaflets will be distributed a "courtesy" card was printed stating that "The Potomac Flying Service Inc. will extend every courtesy to the friends of Mr. Blank." The name of the person who gives out the courtesy card is written in that space. This serves a double purpose. First it eliminates the promiscuous distribution of the ticket books which if lost would mean a loss of a hundred and fifty dollars and at the same time creates a desire in the bus and taxi drivers to distribute them. The Potomac Flying Service gives the same commission to the person whose name is on the courtesy card as it does to the agency which sells a regular flight ticket. It was also found that many visitors who fight shy of the tickets, accept the courtesy cards and go out to the field with the feeling that with that card they will receive special attention. These cards are kept, and at the end of each week the persons whose names are on the cards are paid their commissions. These courtesy cards are left wherever the



*The center spread of the school circular used by Potomac Flying Service, Inc.*

leaflets are placed for distribution and are also given to all taxi drivers who come out to the field or who are reached by the "contact men."

A special show card of two sizes was drawn up and it is an artistic blending of purple, orange, yellow and green which would catch the eye from the distance. A mono design at the top was made for the purpose of arousing the curiosity. These cards have very little reading matter. "Fly over Washington" they suggest and give the name of the company, its location and price for a flight. These cards were placed in all the offices handling the company's tickets, hotel lobbies, newspaper offices, cigar and news stands, office buildings and in some of the buses. A card of the same design but somewhat smaller was printed to be hung in 2,000 hotel rooms.

Arrangements were also made with one of the independent

*Continued on page 1164*

# Wing Analysis

## Stress Analysis of Commercial Aircraft, Chapter Number Seven

By PROFESSOR ALEXANDER KLEMIN

*Daniel Guggenheim School of Aeronautics*

And GEORGE F. TITTERTON

*Late of the Bureau of Aeronautics, Navy Department*

IN ANALYZING an airplane the usual order of procedure is wings, landing gear, fuselage including the engine mount, tail surfaces, and the control system. The order may be slightly varied if more convenient but the wings and landing gear must be analyzed before the fuselage as they both impose loads which must be carried through this part of the structure.

Before starting an analysis it is best to collect all the design data that is likely to be required and to list the following items under the heading of General Data:

Airfoil Section
Gross Weight of Airplane (fully loaded)
Weight of Wings (to be estimated if not known)
Net Weight of Plane (Gross weight—Wing weight)
Total Span of Plane Upper Wing Lower Wing
Length of center section: Upper Wing Lower Wing
Length of Bay: Upper Wing Lower Wing
Length of Overhang Upper Wing Lower Wing
Chord Upper Wing Lower Wing
Gap (distance between wings)
Gap/Chord ratio
Stagger (in degrees)
Incidence Upper Wing Lower Wing
Dihedral Upper Wing Lower Wing
Area of Wings (including ailerons):
Upper Wing— Lower Wing— Total:
Location of Wing Spars in per cent. of chord from leading edge:
Front Upper— Rear Upper—
Front Lower— Rear Lower—
Center of Pressure in per cent. of chord:
Upper Wing Lower Wing
High Incidence—
Low Incidence—
Inverted Flight—
Load Factors required:
High Incidence— Low Incidence— Inverted Flight—
Ratio of Chord to Beam components:
High Incidence— Low Incidence—

The required weights must be estimated as closely as possible. This is best done by comparison with similar planes or from knowledge gained in previous designs. At the present stage of airplane development a good first guess at the weight of wings might be made as follows:

| | *Wooden Wings* | *Metal Wings* |
|---|---|---|
| Lightly loaded biplane | 1 lb. per sq. ft. | 1.25 lb. per sq. ft. |
| Heavily loaded biplane | 1.25 lb. per sq. ft. | 1.60 lb. per sq. ft. |
| Semi-cantilever monoplane | | |
| Cantilever monoplane | 1.50 lb. per sq. ft. | 2 lb. per sq. ft. |

It is true that metal wings can be designed as light if not lighter than wooden wings but only in special cases and after long experience. For the average American manufacturer the above figures are more nearly true.

All lengths such as span, chord, etc. should be listed in inches for convenience in later calculations.

The Gap/Chord ratio is found by dividing the gap in inches by the chord in inches. Gap is the distance between the chord lines of two wings of a plane, measured along a line perpendicular to the chord of the upper wing at any designated point of its leading edge. When the two wings have different chord lengths the arithmetic mean chord is used in figuring the gap/chord ratio. The arithmetic mean chord is the sum of the chords divided by two.

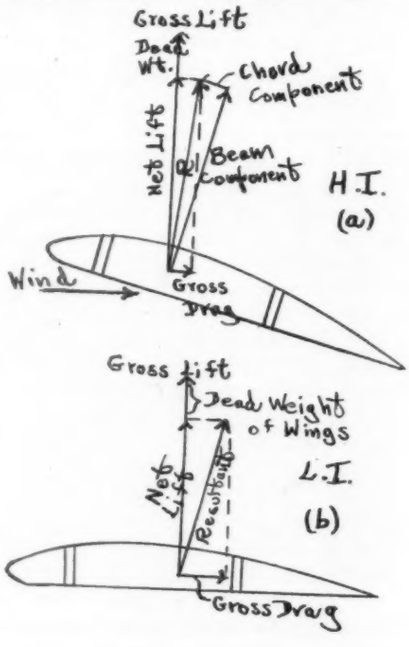



Fig. 50

The stagger between two wings of a biplane is always measured between the forward third points of the wings. This is illustrated in Fig. 53. In equal chord wings the stagger may be measured between any two similar points, but in planes where the chord lengths are different as in the case illustrated, it is necessary to use the forward third points. To find the angle $\theta$, the stagger in degrees, we may measure it off from a side view of the plane drawn to scale. For more accurate work we can measure the distance "d" of Fig. 53, divide it by the gap distance at this point and thus obtain Tan $\theta$. $\theta$ is the desired angle of stagger in degrees.

*Continued on page 1157*

# Airplane Dopes *and* Their Application

By GERALD P. YOUNG

"DOPE" IS the name that has been given to the cellulose base solution used as a filling and finishing material for the fabric covered surfaces of airplanes. It is a product which has been developed to meet a need in the aircraft industry which could not be filled by ordinary finishing materials in use when aircraft were being perfected. Its first use was that of producing a gas film for balloons and airship bags.

The first gliders were covered only by unfinished fabric and it was due to a desire to make this fabric more airtight that finishes were applied. Starch solutions, glue sizes, and other similar water soluble finishes were tried. These were too greatly affected by rain and moisture to be of any lasting value. Varnish was tried and this, though it gave greater resistance to weathering than the previously used water soluble finishing materials, still did not meet the demands. The fabric could not be held sufficiently taut and rigid.

Someone used collodion, a solution of guncotton or cellulose nitrate dissolved in a mixture of ether and alcohol. This produced a clear hornlike film, which filled the pores in the fabric, but also produced another effect, namely that of causing the fabric to tighten and produced a smooth, fairly rigid surface conforming to the airfoil section.

This collodion solution was perfected, using less toxic solvents than ether and alcohol and was the forerunner of the present airplane dope and the modern automobile finish.

## A Study in Itself

The chemistry of preparing airplane dopes or automobile finishes is a study in itself, dependent upon the availability of various organic solvents, gums and plastics. The essential features are covered as follows:

Dope is essentially a collodial solution of cellulose acetate or cellulose nitrate, together with sufficient softeners to give a smooth, homogeneous, flexible film when dry, produce tautness, and thus increase the strength of the fabric.

A fabric-covered surface without the addition of a protective film would be very susceptible to humidity changes, becoming slack or taut with every increase or decrease of atmospheric moisture. It would also lose its strength quite rapidly and could not give any protection to the interior wing structure. Coating the fabric-covered surfaces renders them weatherproof, tightens the surface to conform to the wing section, and produces a more nearly rigid airfoil.

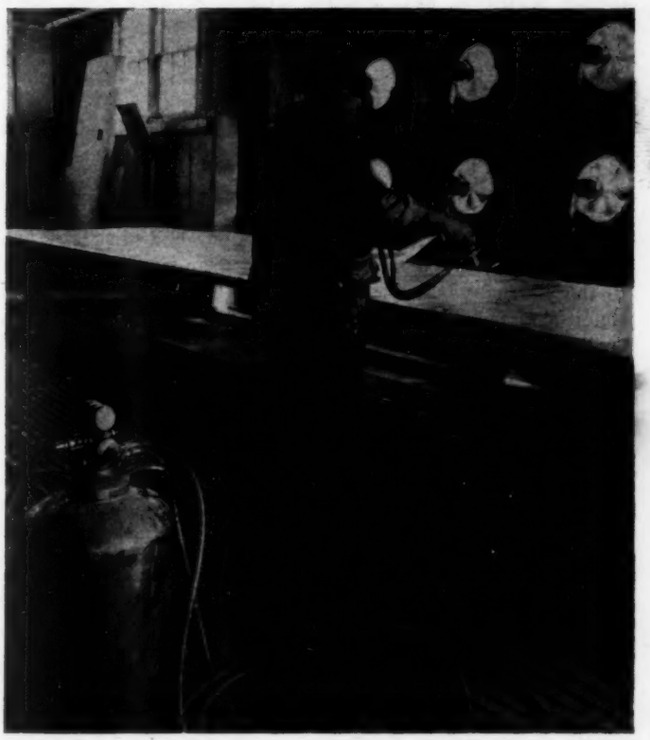
The essential constituents of clear dope are five in number:

a. The film-base compound.
b. The softeners or flexilizers for producing a flexible film.
c. The solvents for film-base material.
d. The diluents for thinning the solution.
e. The high-boiling compounds for controlling evaporation and preventing blushing—that is, provided ventilation is properly controlled.

The film-base compounds are cellulose acetate or cellulose nitrate. Cellulose acetate is the more expensive compound owing to the cost of the raw materials required to prepare it and to its more complicated process of manufacture.

Softeners or flexilizers are required to produce a flexible film, as the cellulose acetate or nitrate alone would be too brittle.

The solvents are the liquids which are used to dissolve the cellulose base materials. Acetone, methyl acetone, and methyl



*A well ventilated dope room. Note that the work is between the operator and ventilating fans.*

acetate are the most commonly used for cellulose acetate. Amyl acetate, butyl acetate, and ethyl acetate are the most commonly used for cellulose nitrate.

The diluents or thinners are liquids which have no appreciable solvent power by themselves, but are added to the solution to keep down the expense of the dope mixture. They evaporate completely with the volatile solvents. Common diluents for both cellulose acetate and nitrate dopes are benzol, ethyl alcohol, and methyl alcohol.

The high boilers help to prevent whitening or blushing of the dope while it is drying. They tend to hold the cellulose acetate in solution when it is dried under conditions of rela-

*Continued on page 1156*

# German Plane Crosses North Atlantic East *to* West

## Junkers "Bremen" Flies 2,125 Mi. Non-Stop from Ireland to Labrador

WESTWARD NON-STOP passage of the North Atlantic in a heavier-than-air craft was finally accomplished on April 13 when Capt. Hermann Koehl, Commandant James Fitzmaurice, and Baron Guther von Huenefeld landed their Junkers monoplane "Bremen" at Greenely Island lying in the Strait of Belle Isle between Newfoundland and the lower Labrador Coast. The trio had left Baldonnel Airdrome, near Dublin, Ireland, at 5:38 A.M. April 12, or 12:58 A.M. Eastern Standard Time, and had flown their all metal monoplane across the Atlantic; finally, swerving some 400 mi. north of their plotted course with bad weather facing them and fuel low, they landed at Greenely Island. In landing, the weight of the plane cracked the ice and landing gear and tail were damaged.

As AVIATION goes to press, every means is being made to reach the fliers who are isolated on the little barren tract of land. A Fairchild Cabin Monoplane powered with a Wasp engine and equipped with ski landing gear has made its way to the Greenely Island colony through very adverse weather conditions, Duke Schiller piloting the plane. Spare parts, furthermore, are being shipped from the Junkers Corp. of America to repair the damaged Bremen.

### In Air Nearly 37 Hr.

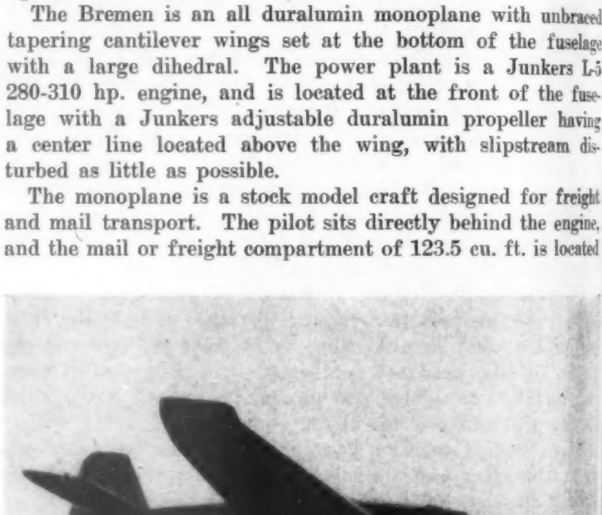
Though exact details are not known at this time, it is understood that the Bremen reached Greenely Island at 1:30 P.M. Eastern Standard Time April 13. This means that the Bremen was in the air nearly 37 hr.; and since the air distance from Baldonnel Airdrome to Greenely Island is 2,125 mi., little more than 59 m.p.h. average speed was maintained by the monoplane—an indication of conditions encountered en route. The Bremen under normal conditions cruises at 95-110 m.p.h.

Special preparations were made for the Bremen's flight. On March 26, Hermann Koehl, Arthur Spindler, and Baron von Huenefeld took off from Tempelhof Field, Berlin, and flew to Baldonnel Airdrome, where Junkers mechanics awaited to prepare the plane for the Atlantic hop planned for the morrow. Bad weather, however, ensued; and though the monoplane was kept in readiness during the days that followed, adverse weather prevented an attempt. In the meantime, Spindler returned to Germany and Commandant James Fitzmaurice of the Irish Free State Air Force took his place as co-pilot with Hermann Koehl.

Finally, on April 12 the signal was given for the take off. The Bremen was fueled with some 600 gal. of Benzol primed with ether—a special mixture used in the L-5 engine. The plane left from the concrete platform between the hangars, rolled over a stretch of ground into which railroad ties had been sunk to give good traction, and then lifted into the air at 800 yd. The Bremen touched the earth, however, about 100 yd. further; but Koehl skillfully brought the plane into the air again and the flight was started. A special landing gear had been fitted to the plane to insure a take off with the two and one-half tons of fuel carried. An oil and parsfin preparation had been spread over the wings to guard against the formation of ice.

The Bremen is an all duralumin monoplane with unbraced tapering cantilever wings set at the bottom of the fuselage with a large dihedral. The power plant is a Junkers L-5 280-310 hp. engine, and is located at the front of the fuselage with a Junkers adjustable duralumin propeller having a center line located above the wing, with slipstream disturbed as little as possible.

The monoplane is a stock model craft designed for freight and mail transport. The pilot sits directly behind the engine, and the mail or freight compartment of 123.5 cu. ft. is located



*The "Bremen" soaring above Baldonnel Airdrome prior to its record flight.*

behind the pilots' cockpit and is connected with the same by a door. The fuselage is constructed entirely of duralumin covered with corrugated sheet metal skin.

The wings and tail of the craft are internally braced, constructed entirely of duralumin with tubular spars and tetrshedral bracing of Z-section struts, and are covered with corrugated duralumin sheeting.

The Junkers L-5 engine develops 310 hp. at 1,500 r.p.m. It is a six cylinder in-line water cooled engine weighing 695 lb. without propeller, hub, water, oil, or exhaust manifold. It has a bore and stroke of 6.3 in. by 7.5 in.

The general specifications of this type of Junkers—the J-33-L—are:

| | |
|---|---|
| Span | 58 ft. 6 in. |
| Length | 34 ft. 6 in. |
| Height | 9 ft. 6 in. |
| Weight empty | 2,640 lb. |
| Normal useful load | 1,990 lb. |
| Normal weight loaded | 4,630 lb. |
| Weight for flight | 8,140 lb. |
| Area of wing | 463 sq. ft. |
| High speed | 123 m.p.h. |
| Cruising speed | 97 m.p.h. |
| Landing speed | 53 m.p.h. |
| Climb from 3,280 ft. to 6,560 ft. (1,000 to 2,000 m.) | 5 min. |
| Ceiling (without altitude control) | 19,000 ft. |
| Fuel consumption (without gas economizer) | .485 lb./hp./hr. |
| Oil consumption | 6.6 lb./hr. |

Koehl and von Huenefeld first attempted an east-west trans-Atlantic flight in the Bremen on Aug. 14, 1927. Frederich Loose was co-pilot in this attempt, which failed when heavy weather was met over the Atlantic after the plane had flown from Dessau, Germany, over England and Ireland and out to sea. With no headway being made, the monoplane was turned back.

Commandant James Fitzmaurice also tried previously when he accompanied Captain McIntosh on an attempt Sept. 16, 1927. They, too, were forced to turn back.

### All Three Fought in War

Hermann Koehl, chief pilot of the successful flight, was a bombing pilot during the war and was until lately chief pilot of the Luft Hansa Pilots' School. Commandant James Fitzmaurice was commissioned in the R.A.F. in the latter part of the war, following which he was steadily advanced until he became commandant of the Irish Free State Air Force. Fitzmaurice now holds the rank of major—a promotion resulting from the present flight.

Baron Gunther von Huenefeld also fought in the World War. He was backer and passenger on the two attempts of the Bremen, pumping fuel for the engine and keeping log in the flight to Greenely Island.

The flight from Baldonnel to Greenely Island is the first non-stop east-west crossing of the North Atlantic. The first east-west flight in a heavier-than-air craft was made by the U. S. Army World Fliers in 1924 when the Chicago and the New Orleans flew from Kirkwall, Scotland, to Casco Bay, Me., with stops in Iceland, Greenland, Labrador, Newfoundland, and Nova Scotia.

## Handley-Page Now in United States To Demonstrate His Slotted Wing

FREDERICK HANDLEY-PAGE, head of the English airplane company bearing his name and designer of the Handley-Page bombing plane used by the British during the World War, is now in America, having landed in New York City April 12. While in this country, he is to demonstrate the use of the slotted wing device which he developed to bring greater safety to airplane flight.

The U. S. Navy recently tested a Consolidated NY-2 seaplane fitted with the Handley-Page slotted wing and has decided to make experimental installations of the device on all its service planes. Rights to the patents in this country are held by the Government as far as military use is concerned; commercial rights are retained by the Handley-Page Company.

The February 27 issue of AVIATION described the operation of the slotted wing, which in effect increases the lift when the slotted section automatically opens as the plane reaches the stalling angle. The stall and consequent tail spin is obviated, it is declared, by the action of the device.

## Costes and Lebrix Back in Paris After World Trip of 35,000 Mi.

HAVING COMPLETED a 35,000 mi. trip around the world entirely by air but for passage by ship from San Francisco to Tokio, Capt. Dieudonne Costes and Lieut. Comdr. Joseph Lebrix landed their Breguet biplane "Nungesser-Coli" on Le Bourget Field, Paris, April 14. The French airmen's flying time totalled some 338 hr. for the flights which took them from Paris, where they took off Oct. 10, 1927, to Africa, across the South Atlantic, through South America, Central America, North America, and finally, after the Pacific had been crossed in a liner, from Tokio through Asia and back to Paris.

Especially quick was the trip from Tokio to Paris; for the two fliers left the Japanese capital on Sunday April 8 and in nine fast flights arrived at Le Bourget Saturday, April 14—less than a week's time elapsing. The stops made on this fast trip of 10,370 mi. were Port Bayard, near Tongking; Hanoi, Indo-China; Calcutta, India; Karachi, India; Basra, Iraq; Aleppo, Syria; Athens, Greece, Marseilles, France; and Le Bourget Field, Paris.

Costes and Lebrix received a great national welcome on their arrival home. Gold medals of the City of Paris and medals of the officers' rank, Legion of Honor, were presented in opening receptions, and many other honors now await the fliers in remaining ceremonies. With celebrations over, it is their plan to attempt an east-west trans-Atlantic flight.

The Breguet biplane used by the Frenchmen and the engine which powered it have shown their great reliability. The Breguet is a No. 19 Grand Raid type. The power plant is the No. 51 Vee type, 12 cylinder, water cooled Hispano-Suiza 450 hp. engine. A feature story concerning the Paris to New York flights of Costes and Lebrix appeared in the Feb. 27, 1928 issue of AVIATION.

## Hull Bros., Inc., of New York City Named Challenger Airplane Dealer

HULL BROS., Inc., of New York City, operator of flying fields at New Vernon and Orange, N. J., has been appointed dealer for the Challenger airplanes by the Gates Flying Circus & Aviation Corp. of Newark, N. J. The Newark company is distributor of the Challenger plane for Northern New Jersey and Southern New York.

Delivery of the first Challenger plane to the Hull company has been made, and two more of the planes are to come in within a few weeks. The new planes are to be put into commercial use on the company's fields.

The Hull company territory includes Hunterdon, Warren, and Sussex Counties, as well as parts of Essex and Morris Counties, all in New Jersey.

## Elmer A. Sperry Named President Of Guggenheim Medal Fund Board

ELMER A. SPERRY was elected president of the Board of Directors of the Guggenheim Medal Fund at a recent meeting of that group at the offices of the Guggenheim Foundation for the Promotion of Aviation in New York City. The Guggenheim gold medal is awarded for notable achievements advancing the science of aviation.

Other officers named at this meeting were Edward P. Warner, assistant secretary of the Navy in charge of aeronautics, vice president; and Alfred D. Flinn, secretary of the United Engineering Society, secretary and treasurer.

# B. F. Mahoney Company Turns Out A Special Brougham for Lindbergh

THE B. F. MAHONEY Aircraft Corp., San Diego, Calif., recently delivered to Charles A. Lindbergh a special Mahoney Brougham to replace the Spirit of St. Louis which, it is understood, is to be placed in the Smithsonian Institution. This new plane incorporates many new features suggested by Colonel Lindbergh. The cabin is fitted with seats for four passengers in addition to the pilot who sits in front where he has a wide range of vision. The fuel tanks, with a total capacity of 115 gal., are carried in the wings. The wings are also fitted with 250,000 candle power landing lights in the leading edge for night flying. In addition, magnesium parachute flares are carried in the rear of the passenger cabin and controlled from the instrument board. The rubber shock absorbers have been replaced by Cleveland Pneumatic Aerol struts and wheel brakes have been fitted. The former type of tail skid has been replaced by one fitted with a castor wheel. The areas of the tail surfaces and of the ailerons have been increased to insure better maneuverability for the large wing. To provide for varying loads in the cabin, the stabilizer has been fitted with a nine degree angle of adjustment.

The special Whirlwind engine, the gift of the Wright Aeronautical Corp., is trimmed with nickel plated rocker boxes, push rod covers, etc. An electric inertia starter, controlled

*The special Ryan Brougham which replaces Colonel Lindbergh's famed Spirit of St. Louis now destined to a place in the Smithsonian Institution.*

from the instrument board, is provided. The instruments mounted on the panel, in front of the pilot's seat, include altimeter, tachometer, air speed indicator, oil and temperature gauges, turn and bank indicators, gasoline gauge, light switches, and primer. Most of these instruments were supplied by the Pioneer Instrument Co. The cabin is lavishly upholstered in silk mohair with walls lined with balsam wool to insulate against extreme temperatures, as well as to minimize the engine and propeller noises. Two full height doors are provided; one is fitted with an exterior coach type lock while the other locks from the inside.

The specifications are as follows:

| | |
|---|---|
| Height | 9 ft. 10 in. |
| Span | 46 ft. |
| Chord | 7 ft. |
| Wing section | Clark Y |
| Overall length | 27 ft. 9 in. |
| Tread of wheels | 10 ft. |
| Weight empty | 1870 lb. |
| Pay load | 800 lb. |
| Wing area including ailerons | 319 sq. ft. |
| Rudder area | 11 sq. ft. |
| Elevator | 16½ sq. ft. |
| Stabilizer area | 26 sq. ft. |
| Fin area | 4 sq. ft. |
| Maximum speed | 126 m.p.h. |
| Landing speed | 49 m.p.h. |
| Climb (sea level) | 900-1200 f.p.m. |
| Service ceiling | 16,000 ft. |
| Take-off | 610-660 ft. (approx.) |
| Gross weight | 3,600 lb. |
| Useful load | 1,550 lb. |
| Gasoline capacity | 115 gal. |
| Oil capacity | 10 gal. |

# To Equip the New Wright Engines With Special G. E. Superchargers

ANNOUNCEMENT HAS been made by the General Electric Co. that specially designed superchargers the company has developed will be built into three new types of Wright aircraft engines as standard equipment. Experiments with the new engines are now being carried on by the Wright Aeronautical Corp. in its test laboratories at Paterson, N. J. Maximum efficiency of operation, easier starting, greater reliability, and better performance at high altitudes are expected of the engines with the use of the supercharger.

Superchargers have been in frequent use on airplanes ever since the war, but applications have been few and principally on aircraft designed for high altitude flights. The practice in the past has largely been to modify standard engines to accommodate an external supercharger, but the rapid advance in research which has taken place in the past few years has resulted in the design of a supercharger which is now being adopted by all leading airplane manufacturers in this country for engines in sizes up to about 600 hp. This device is made a unit part of the engine.

### Engine Built for Supercharger

It was a direct result of the use of these superchargers that a new type of airplane engine was developed, utilizing air cooling, equipped with radial cylinders, and having a supercharger built in as an essential item of the engine construction. The supercharger is primarily designed to improve the gasoline distribution and to give a small amount of supercharging when flying near sea level. In most cases, however, it is so arranged that it can be used to maintain sea level power when flying at moderate altitudes. Thus, by maintaining sea level conditions at the engine inlet, airplane engines can develop much higher power at any given altitude than was possible without the supercharger. This makes it possible to carry heavier loads and develop higher speeds.

Superchargers on radial engines consist of a high speed impeller driven by the engine shaft through gears surrounded by air conduits of the proper shape formed as part of the engine crankcase. The only extra parts, therefore, are the comparatively small impeller and a pair of gears.

A piece concerning the new 140, 200, and 300 hp. Wright company engines which will use the General Electric supercharger was published in the March 26 issue of AVIATION.

# Van Sicklen New Sales Manager Of the Hamilton Metalplane Co.

ANNOUNCEMENT HAS been made by the Hamilton Metalplane Co. of Milwaukee, Wis., that C. F. Van Sicklen has been appointed sales manager of that concern. Mr. Van Sicklen was formerly sales and advertising manager of the Advance Aircraft Co., Troy, O., manufacturer of the Waco planes.

# Fairchild Company Will Open New Caminez Engine Plant Next Month

A NEW Caminez engine manufacturing plant will be put in operation about the first of May, according to a recent announcement by the Fairchild Aviation Corp. of New York, of which the Fairchild Caminez Engine Corp. is a subsidiary. With the new factory in production, the output of two or three engines a week will be increased to 10 engines by July 1, it is estimated, with a possible maximum production of 20 engines per week if occasion demands.

The new factory, construction of which began early this year, is located about one and one-half miles from Farmingdale, L. I., N. Y., along the Broad Hollow Rd. The plant covers a ground area of some 30,000 sq. ft. and is to be used exclusively for quantity, standardized production of the Caminez power plant. This will be the first completed unit of a three-phase construction program of the Fairchild company which includes, as well, a new flying field and airplane manufacturing plant.

Of the 114 acres of land at the Broad Hollow Rd. site, eight have been reserved for manufacturing space, equally divided between the new engine and airplane factories. The

*The new engine plant of the Fairchild Caminez Engine Corp. Note saw-tooth roof and steel sash construction.*

remainder of this tract will form the flying field, which will be used for testing purposes and for the housing of privately-owned planes.

The new engine factory, 182 ft. by 151 ft. in size, is so designed that its ground area can be tripled whenever desired. The building is constructed of brick with steel trusses and steel sash, and with a saw-tooth roof of fireproof gypsum blocks. The entire arrangement is such that the greatest amount of sunlight can be had at all times together with a large and unobstructed floor space on the inside. In addition, the design has incorporated the features of automobile construction, the production line plan being used. Raw material will be introduced in one section of the plant to be worked and assembled step by step through the various sections of the factory until the completed Caminez engine is produced.

The actual work of processing will be divided among eight sections, or bays, so arranged that it will progress in natural sequence. All work in each bay will be routed from the south end to the north end of the building.

# Ontario Marine and Airways, Inc., Is Organized at Rochester, N. Y.

NEWLY FORMED in Rochester, N. Y., the Ontario Marine and Airways, Inc., has begun flying activities at Brizee Aviation Field, seven miles northeast of the city, which it has leased for four years. Leslie Thorpe, formerly a lieutenant in the Navy in charge of the bombing and navigation schools at Pensacola, is president of the new company.

The company is at present operating a Waco 9 and a Pitcairn Orowing, and two more planes are to be added to the fleet in the latter part of May. The concern will engage in flight training, aerial advertising, passenger and express transport work, orchard dusting, mapping, and airplane and accessories sales work. Arrangements have already been completed, according to Thorpe, to teach a class of 25 freshman students at the University of Rochester in airplane construction and actual flying as well.

Officers of the company besides Mr. Thorpe are Warren Brizee, vice president and field manager; Geoffrey Sargent, treasurer; and Selye Whitmore, secretary. The pilots are Brizee, Paul Herman, Thorpe, and F. Briggs Barlow, formerly a lieutenant in the British Royal Flying Corps. The city office is at 37 S. Union St.

# Eight More Planes are Approved By the Department of Commerce

EIGHT MORE airplane models have been approved of late by the Department of Commerce Aeronautics Branch. The models follow:

29. Air King, OX-5, National Airways System, Inc.
30. Travel Air, OX-5, Model 2000, Travel Air Mfg. Co.
31. Travel Air, Hisso, Model 3000, Travel Air Mfg. Co.
32. Travel Air, Whirlwind, Model 4000, Travel Air Mfg. Co.
33. Buhl Airsedan, CA-5-A, Buhl Aircraft Co.
34. Loening Amphibian, Wasp, Loening Aeronautical Engineering Corp.
35. International, F-17, International Aircraft Corp.
36. Pheasant, OX-5, Pheasant Aircraft Corp, Inc.

# Chance Vought Company Acquires New Building as Orders Increase

WITH INCREASE in airplane orders necessitating additional facilities, the Chance Vought Corp. at Long Island City, N. Y., has acquired a new building adjacent to the main plant which greatly augments manufacturing space. Assembling and finishing of both fuselages and wing sections is now being done in the new building, while assembling of parts is carried on in the old plant. A third building, furthermore, houses the engineering department and serves as a laboratory for conducting experiments on new designs. Output at the plant is now one plane a day or five planes a week with the five day working schedule followed.

# New Model Ford-Stout Monoplane To Appear Within a Few Months

THE STOUT Metal Airplane Co., division of the Ford Motor Co., is bringing out a higher powered model of its three-engined type. This new plane will be powered with three Pratt & Whitney Wasp engines developing 400 hp. at 1900 r.p.m. It is understood that a number of these planes are on order and now in the process of construction. They will be available by late spring or early summer.

# Ryan Brougham Monoplane Price Raised from $11,500 to $12,200

PRICE OF the Ryan Brougham monoplane has been raised from $11500 to $12,200, according to a report from the B. F. Mahoney Aircraft Corp. of San Diego, Calif., manufacturer of the plane. The price increase, it is stated, is to cover improvements. An extra charge of $300 will be made for equipment with steel propeller, the company states further.

# Last Minute Briefs

The Aero Development Co. of Cedar Rapids, Ia., is developing an air cooled, radial aircraft engine.

The Boeing "Flamingo" biplane flying boat has been tested in the waters near Seattle, Wash.

Miller Airplane Products, Los Angeles, Calif., is developing a 110 hp. air cooled engine.

Arthur C. Chester of Downers Grove, Ill., has taken the Travel Air agency for Northern Illinois and Indiana.

The Miller Corporation at New Brunswick, N. J., has become dealer for the Travel Air planes for that vicinity.

The first production Hallett engine is being installed in a Thunderbird plane in Los Angeles, Calif.

The Champion Spark Plug Co. is producing a new spark plug for aviation engines.

Stout Air Services, Inc., plans an extension of its Detroit-Cleveland line to Chicago.

Aircraft Industries, Inc., Oakland, Calif., is constructing a three place monoplane to be powered with the Comet 150 hp. engine.

The Washington, D. C., Board of Trade will shortly issue official time tables for air mail plane schedules throughout the country.

Aerotech, Inc., aeronautical engineering company, has announced it has taken new headquarters at Moline, Ill. The concern was formerly located at Streator, Ill.

An addition to the factory of the E. M. Laird Airplane Co., Chicago, is to be built. Floor space will be increased by one-third and operations will be greatly facilitated.

M. S. Boggs, Aeronautics Branch of the Department of Commerce inspector for New York State, has been assigned to Territory No. 7 and will have headquarters at Detroit.

The British Air Ministry has completed the largest military plane ever built, the Bearmore "Inflexible". It is a monoplane with a span of 158 ft. weighing nearly 30,000 lb.

Two new lighting units for use by airports have been announced by the General Electric Co. One is an airport ceiling light, the other an intermediate field boundary light.

A building program now planned by the Wright Aeronautical Corp. of Paterson, N. J., will increase production capacity of the company to 180 engines a month, according to reports.

Betz Air Lines, Inc., a new company in Hammond, Ind., is now operating a Ford-Stout eight passenger plane in sightseeing trips over South Chicago with the Ford Airport at Lansing, Ill., as a base.

As AVIATION goes to press, two more airplanes have been granted approved type certificates. They are No. 37—Travel Air biplane model 8000, Caminez engine, and No. 38—Travel Air biplane model 9000, 125 hp. Ryan-Siemens engine.

Federal patent of an invention of twin tanks to replace the old pontoons on seaplanes has been granted to Milton M. Karger, Milwaukee, Wis. Increased floating capacity and stability, it is claimed, result with use of the tanks.

Three Vought Corsairs have been fitted with amphibian landing gears and are being tested by the Navy. The undercarriage is a single pontoon with wheels attached to the chine and a tail skid in the rear.

The Ohio Aero Manufacturing Corp., Youngstown, O., is producing two planes, the Youngstown Youngster and the Airmaster Coupe, two and three place monoplanes respectively. They will be powered with LeBlond engines.

The Bristol Aeroplane Co., Ltd., Filton, England, manufacturer of the Bristol Jupiter engine is building a 250 hp., five cylinder, air cooled, radial engine using cylinders identical to those of the Bristol Jupiter 450 hp., nine cylinder engine.

Umberto Nobile, Italian explorer, has flown his semi-rigid dirigible "Italia" from Milan, Italy, to Seddin Zeppelin Field, Stolp, Germany, on the first leg of the series of flights which are to take him over the North Pole for scientific exploration.

The Fairchild Aviation Corp. of New York has opened a branch office at 332 S. Michigan Blvd., Chicago, for sales and service purposes. An information bureau is also included, E. W. Fuller, manager, announces.

Charles Levine is building at the Long Island City, N. Y., plant of the Columbia Aircraft Corp., a high wing monoplane to be powered with a Packard 600 hp. engine. The plane was designed by a French and a Russian engineer.

The Short Calcutta flying boat, described in AVIATION last week, is to be used on the British "All-Empire" air route running from Brindisi, Italy, across the Mediterranean to Alexandria, Egypt.

Bert Hall, war-time flier, has announced he will use a monoplane now nearly completed in Charles A. Levine's plant at Long Island City, N. Y., in a Seattle to Tokio flight shortly. The plane will be powered with a 12 cylinder Packard engine, it is reported.

The Packard Electric Co., Warren, O., has purchased a Stinson-Detroiter cabin plane to be used in maintaining contact with its various branch offices. The plane was sold by the Thompson Aeronautical Corp., Cleveland, Stinson distributor for Ohio and part of Pennsylvania.

The Travel Air Manufacturing Co. has completed a new monoplane powered with a Wright Whirlwind engine. It carries four passengers and 150 lb. of baggage or pilot and 1000 lb. mail or express. Top speed is 126 m.p.h. and landing speed 57 m.p.h.

Pitcairn Aviation, Inc., of Philadelphia has appointed Harold A. Holbrook as director of Public Information of the organization. Increasing demand of various publications for aeronautical news lead to the appointment of Holbrook, who left the New York Herald-Tribune to take up his new duties.

That $1,000,000 of the $2,000,000 capitalization of the Union Air Lines has been subscribed is announced by Charles V. Eakin, president of the new company. Union Air Lines has bought out the West Coast Air Transport Co., and now proposes to operate a transcontinental line extending along the West and then turning east to Chicago and eventually New York.

## "Pirate" Bombers Being Built To be Sent to U. S. Possessions

THE KEYSTONE Aircraft Corp. of Bristol, Penna., is now manufacturing 25 giant "Pirate" bombing planes for the U. S. Government. Fifteen of these are destined to foreign possessions, five going to Panama, five to the Philippines, and five to Hawaii.

To ship these bombers, 60 special flat cars will be needed with special clearance for bridges and tunnels. The shipment, said to be the largest single government aircraft shipment ever made, will consist of 90 specially built cases weighing more than a ton each. Four flat cars will be required for the parts of each plane, and 138,000 ft. of lumber in various sizes, 500 rolls of three-ply roofing paper, 15,000 lag screws, 2,000 lb. of nails, 1,000 bolts, 2,500 sq. ft. of heavy wire mesh screening, and 1500 ft. of canvas tape will be needed in packing. This is in accordance with government specifications, and each crate must be built to taper so that it will fit into the hold of the vessel. Each crate must be painted with two coats of olive drab paint inside and out as a preservative. The heavy wire screen mesh has been specified to prevent rats from entering the crates and possibly destroying valuable aircraft parts.

## Loening Amphibian Approved One Week After Plane is Completed

THE LOENING Cabin Amphibian, which was described in detail in AVIATION for April 9, 1928, was awarded the Department of Commerce Airworthiness Approved Type Certificate No. 34 within one week after the first plane of this type had been completed. Immediately after preliminary flight tests in the waters about New York City and on land at Mitchel Field, Long Island, N. Y. the plane was flown to Washington, D. C., for the approval of the Department of Commerce. Tests were made under the supervision of inspector Chester A. Charles at Bolling Field, Washington, D. C., and in the Potomac River off the Naval Air Station. Powered with a Pratt & Whitney Wasp engine, the Cabin Amphibian was approved for land or water service carrying a useful load of 2,120 lb. which includes 1,200 lb. pay load in addition to pilot and fuel. As the plane weighs 3,730 lb. empty it has gross weight of 5,900 lb. with this load. Immediatley after the completion of the Department of Commerce tests the amphibian was flown non-stop to Detroit, Mich., where it was exhibited at the All-American Aircraft Show.

## Inland Eaglerock Co. is Organized In Spokane to Distribute Planes

ORGANIZATION OF the Inland Eaglerock Co. of Spokane, Wash., was recently announced. The company will distribute Eaglerock planes, which are manufactured by the Alexander Aircraft Co. of Denver, in Eastern Washington and Northern Idaho. Dealers in the territory will be named soon.

A permanent base of operations will be obtained at once, and two more planes besides the Eaglerock now owned, will be ordered. These planes are to be used for aerial taxi service, student training, and photographic work.

H. N. Fogle is president; William Holland, vice president; Art Stimson, secretary and treasurer and aerial photographer; and Ed Bigelow, George Gault, and William Genero are directors. Bigelow is also chief pilot.

## Landing Fields in United States Now Reported to Number 5,000

LANDING FIELDS in the United States now number 5,000 according to a statement issued by the Aeronautics Branch of the Department of Commerce. A list of 1,075 airports has been made public by the Department, and with nearly 4,000 others available for landings, the country now offers numerous facilities for the ever increasing number of pilots. Many of the fields offer landing and take off tracts alone, but 231, on the other hand, are fully equipped with the latest aeronautical aids for day and night flying.

California, with 115 air fields, leads all other states. Eight of the 115 are marked and lighted by the Department of Commerce along regular airways and seven others are also equipped for night flying. Texas is second with 90 fields, only two of which, however, are maintained by the Department for night flying, and three others similarly equipped.

Pennsylvania, third in rank with 68 fields, has 24 airports fully equipped and maintained along airways by the Department, more than any other state. In addition Pennsylvania has two other airports for night flying. Illinois with 58, of which 23 offer facilities for night landing, and Ohio and Oklahoma each with 43 fields, follow. Wyoming has the highest proportion of most modernly-equipped fields, 17 of 21 fields offering all night aids.

Intermediate landing fields along regular air mail routes in the United States, marked and lighted by the Department of Commerce, are numbered at 153. In addition there are listed 78 commercial or other fields, equipped with rotating beacons and partial or full equipment of flood lights for landing, flood-lighted buildings, boundary lights, and danger lights.

## Port Angeles, Wash., Business Men Wield Picks and Build Own Runway

AN AIRPORT built literally by civic enterprise can be boasted by Port Angeles, Wash. The town treasury was low, but it proved no obstacle in the path of a determined group of business men and civic leaders who wanted to waste no time in placing the city on the aviator's map.

Donning overalls, arming themselves with picks, shovels, and other implements, 75 Port Angeles business men and civic leaders representing the Rotary, Kiwanis, Young Men's Business Club, and Chamber of Commerce, recently went to work building a runway on the airport site. Before nightfall the 75 workers had completed the leveling and grading of a runway sufficient in length and width to permit an airplane to land or take off. Mayor W. B. Hedrick and Port Engineer W. J. Murphy were in charge of the work.

## Los Angeles-San Antonio Passenger Line to be in Operation by June 1

REGULAR DAILY passenger service between Los Angeles and San Antonio, Texas, will start not later than June 1, according to a recent announcement by W. C. Earlywine of the Pacific and Gulf Airlines, a Los Angeles concern organized to install this airline.

Earlywine said that a trip will be made each way daily on a schedule of 12 hr. elapsed time. It was said that an equipment of two 10 passenger tri-engined monoplanes and two six passenger single engined biplanes has already been ordered.

# Production Started by A. V. Roe On Avian III Using Cirrus Engine

A. V. ROE & Co., Ltd., Newton Heath, Manchester, England, recently announced that it was starting production on a new model of the Avro "Avian", to be known as the Avian III. The new model has a smaller wing area, namely 244 sq. ft. and is of sturdier construction than the Avian II being somewhat heavier. The Avian III weighs 875 lb. empty compared with the Avian II which weighed 695 lb. empty. The new model, because of its reduced wing area, carries a lighter load and weighs 1360 lb. loaded, while the Avian II weighed 1600 lb. loaded. Both of these planes are powered with the Cirrus II engine rated at 75 hp. at 1,800 r.p.m. and developing 80 hp. at 2,000 r.p.m. With this engine the Avian III is stated to have a high speed of 105 m.p.h. at sea level and a high speed of 100 m.p.h. at 5,000 ft. The plane has a stalling speed of 40 m.p.h. and is said to have a run of 90 to 100 yd. after landing. It takes off in about 75 yd. The climb at sea level is 650 f.p.m. and absolute ceiling is 17,000 ft.

The Avian III is of wood construction with steel struts and fittings. The biplane wings have routed I section spars and ribs with routed plywood webs and spruce cap strips. The wings are mounted so that they may be folded, reducing the overall width of the plan to 9 ft. 6 in. The fuselage has wood longerons with the sides covered with plywood, using no wire bracing. The cockpits are in tandem with the controls removable as a unit. They are all mounted on a removable panel that also acts as the flooring. The Avian has a span of 28 ft. and a length of 24 ft. 3 in.

# Pioneer Instrument Co. Receives Two Large Orders and Contract

RECEPTION OF large orders for instruments from the Fairchild Aviation Corp. of New York and from the Mahoney Aircraft Corp. of San Diego, Calif., has been announced by the Pioneer Instrument Co. of Brooklyn, N. Y. A contract, furthermore, has been signed whereby the Pioneer company will supply a complete line of aeronautical instruments for installation in planes manufactured by the Bellanca Aircraft Corp. of Wilmington, Del.

The order from the Fairchild company calls for 150 sets of various aeronautical instruments consisting of altimeters, bank-and-turn indicators, compasses, and air speed indicators, while that from the Mahoney company specifies 150 sets of tachometers, altimeters, magnetic compasses, and bank-and-turn indicators.

# Airplane Dopes and Their Application

*Continued from page 1149*

tively high humidity and in the presence of the water that forms on the surface owing to the chilling caused by evaporation of the highly volatile solvents.

Besides producing, when dry, a tautness of the fabric that is not greatly affected by changes in atmospheric moisture, dope should act as a protective coating to prevent rapid deterioration from weathering. A clear film of either cellulose acetate or cellulose nitrate dope is transparent to sunlight, and sunlight is the greatest factor in the deterioration of dopes and fabrics.

To prevent excessive deterioration, an opaque protective coating on top of the clear dope film is of the utmost importance. This opaque protective coating is a dope similar to the clear dopes already mentioned, but with the addition of an inert opaque pigment that cuts out the actinic rays of sunlight from the clear dope and fabric. A clear dope will only withstand a few months' constant exposure to the weather, while the same finish protected by an opaque pigmented dope will last for several years.

There has been prepared within the past few years a new system of doping preparation which will give equal protection, produce equal or better tautness, and produce a simpler method of application than that mentioned above. This dope scheme consists in applying four coats of a semi-pigmented dope to the fabric and finishing this with a gloss dope or special fabric lacquer.

The use of this scheme terminates the use of clear acetate or clear nitrate base dopes. The pigment content of the semi-pigmented dope is sufficient to produce adequate protection from actinic light with four coats, and at the same time not sufficient pigment material to affect the brushing, drying, filling, or tautness of the dope.

To produce a finish of maximum durability and minimum weight four coats of this semi-pigmented dope will give all the film protection required. The weight of this finish will be less than 3.5 ounces per square yard exclusive of fabric and may be as low as 2.0 ounces per square yard.

### Four Coat Scheme Less Costly

This four coat scheme will be less costly from a production view-point, as it will require less dope material and reduce the cost of labor in application from six coats to four coats.

Only when the question of smoothness of finished surface and a high gloss finish is desired is it necessary to add more coats. This of course being an obvious conclusion, for to produce the highly smooth gloss finish it is necessary to apply sufficient film to completely fill all inter-thread spaces to a uniform level.

In order to produce a satisfactory wing surface several things should be considered.

The fabric should be stretched to a uniform degree of tautness throughout the surface. This tautness can be determined only by trial as the dope will add to that already given the fabric when applied and is limited only by the strength of the structure. It is not possible to exert manually sufficient force to weaken the fabric in its application, but if it is stretched too tightly at the start the dope will cause a marked distortion of the wing structure when it has thoroughly dried.

To produce a surface that will have the least variation of tautness with subsequent changes in atmospheric humidity, the surface should be doped the same day, if possible, that the surface is covered with fabric. If the fabric is stretched tightly over the structure and then not doped for several days, it assumes a permanent set and loses tautness and will not produce a satisfactory finish. Changes in atmospheric humidity will also cause a variation in the undoped fabric if allowed to wait several days before doping.

The first two coats of dope should be applied by brush and subsequent coats by spray gun for best appearance and speed of production. This is true for both clear or semi-pigmented dopes. The first coat should thoroughly wet the fabric, but should not be brushed any more than necessary to accomplish this. Any grease or oil spots in the fabric should be washed out with benzol or dope thinner before doping. If these are not removed the dope will tend to blister or peel off the oily area.

Normally four coats of dope will produce sufficient tautness and coating for colored gloss finish. When it is desired

to produce a high gloss finish, which adds only to the value of the plane in appearance, care should be used in securing only such colored finishing lacquers as are especially prepared to remain flexible when applied over fabric.

The present day automobile lacquers, while entirely suitable for use over any metal surface, are too brittle to be of any value when applied to doped fabric.

There are several ways of producing a gloss finish. The usual method has been to varnish over the doped surface with a good grade spar varnish. This produces a very high gloss, but it is not entirely satisfactory. The best grades of clear varnish will fail under weather exposure and check more rapidly than the pigmented gloss lacquers. It is also harder to make a good patch over a varnish surface.

A second method is to mix with the semi-pigmented dope used for undercoats a gloss liquid which when sprayed as a finishing coat produces a gloss surface. An advantage of this type over varnish finishes is that the surfaces may be sprayed with new coats at any future date to give a new color or to rejuvenate a weathered finish. This cannot be done if varnish has been used for the finishing coat.

A third method of finishing is to apply over the clear dope or semi-pigmented dope undercoats a finish of lacquer similar to automobile lacquer, but made more flexible by the addition of softening compounds. There are several of the most progressive dope and lacquer manufacturers who are at present producing this type of aircraft finishing material.

### Cost Figured from Area to be Finished

The costs of various dope schemes can be figured from the area of the surface to be finished. Clear and semi-pigmented dopes will cover about 110 sq. ft. of area, one coat, per gallon, when applied by brush, and when properly thinned for spray application semi-pigmented dope, pigmented dope and lacquer will cover about 175 sq. ft. of area, one coat, per gallon.

All doping of airplane surfaces and spraying of metal parts with lacquer should be done in a well ventilated room. The temperature should be kept at about 70 deg. in cold weather.

All brushes, when not in use, should be washed out with thinner or acetone. Spray gun equipment will not give satisfactory performance unless cleaned thoroughly when each day's work is finished. Special care should be taken to drain all dope from liquid feed line, which should be washed out daily.

Any good lacquer spray-gun will handle dope materials but some experience is necessary before speed and uniformity of the finish can be expected.

A good painter usually makes a poor dope man for brush application, for where paint and varnish should be well worked out when applied, dope should be worked as little as possible and the brush kept as full as it will hold without dripping over the work.

When necessary to make a patch over a doped surface certain precautions should be taken. Wash the area with dope thinner, or acetone, to remove any oil, grease or varnish which may be on the fabric. This thinner will soften the dope film and the softened outer coats should be scraped off, with a blunt edged tool such as a putty knife or spatula. The hole or tear should be darned if it is a bad one. The patch should be sufficiently large to extend at least one and one half inches beyond the broken or cut threads.

The edges of the patch should be pinked or frayed about one-quarter of an inch all around. Dope should be applied both to the surface of the wing as well as over the patch. This is important, as otherwise poor adhesion of the patch may result. When the patch is smoothed out and dry, apply similar coats as were originally used over the surface.

# Wing Analysis

*Continued from page 1148*

The location of the wing spars in per cent of chord from the leading edge must be figured. If we divide the distance in inches of the spar from the leading edge by the chord of the wing in inches and multiply the answer by 100 this will give the desired distance in per cent of chord.

The center of pressure of many commonly used wings is listed for the various flight conditions in Table 15. For wing sections not listed the high incidence and inverted flight center of pressure must be taken as its most forward position; the low incidence position is taken as the position at the angle when $K_r = 0.25K_r$ maximum. These values may be readily determined from the wing tunnel data on airfoils.

TABLE 15.

Center of Pressure Location and Ratio of Chord to Beam Components for Various Airfoils

| Airfoil | C. P. Location in % of Chord | | Ratio of $\frac{\text{Chord Comp't}}{\text{Beam Comp't}}$ |
|---|---|---|---|
| | H. I. & I. F. | L. I. | H. I. |
| Aeromarine 2A | 29 | 48 | —0.178 |
| Boeing 103A | 28 | 45 | —0.158 |
| Clark Y | 31 | 51 | —0.144 |
| Curtiss C-62 | 28 | 40 | —0.056 |
| Curtiss C-72 | 31 | 54 | —0.130 |
| Goettingen 387 | 31 | 52 | —0.156 |
| Goettingen 398 | 30 | 50 | —0.167 |
| Goettingen 436 | 31 | 50 | —0.135 |
| Loening 10A | 28 | 45 | —0.166 |
| M 6 | 25 | 40 | —0.225 |
| M 12 | 25 | 40 | —0.140 |
| N 9 | 28 | 45 | —0.132 |
| N 10 | 29 | 48 | —0.150 |
| N 22 | 28 | 48 | —0.155 |
| R A F 15 | 29 | 38 | —0.127 |
| Sloane 105 | 30 | 48 | —0.078 |
| U S A 27 | 29 | 50 | —0.175 |
| U S A 35A | 33 | 56 | —0.126 |
| U S A 35B | 30 | 49 | —0.151 |
| U S A 45 | 27 | 38 | —0.191 |

The ratio of net chord component to net beam component will be assumed as 0.15 in low incidence and zero in inverted flight for all airfoils.

The center of pressure location for "Stable" airfoils in the low incidence condition should be obtained from wind tunnel tests made with ailerons or flaps set down at 20° or 25°. If such data are not available, a location between 45 and 50 per cent. of the chord should be assumed. It has been found that a downward action of aileron or flap moves the center of pressure far back and when a "Stable" airfoil is designed on the forward location determined by wind tunnel tests without aileron or flap action, the rear edge of the wing is usually very flexible.

The load factors required must be determined from Fig. 1 of Chapter 3. The high incidence factor is determined from the curves and low incidence is taken as 65 per cent and inverted flight as 40 per cent. of the high incidence value.

Before listing the ratio of chord to beam components in the General Data it is best to understand why there is such a ratio. The lift force on an airplane always acts at right angles to the wind striking the wing and the drag force acts parallel to the wind. This is illustrated for high and low incidence flight in Figs. 50a and b respectively. In low incidence the lift force so nearly coincides with the beam force that they are taken as equal. That is, the net beam force equals the gross lift force less the dead weight of the wings. It is not considered that the weight of the wings imposes any additional stress upon themselves and so their dead weight is subtracted to obtain the force that will be used in all later calculations, namely, the net beam force.

In high incidence the lift load and the beam load are at greatly different angles. As in low incidence the dead weight of the wings is subtracted from the gross lift load to obtain the net lift load. The resultant force $R$ is based on the total or gross drag load and the net lift load. This force R

however is not perpendicular to the beam and therefore is not equal to the beam load. It may however be broken up into components, one perpendicular to the beam (net beam load) and the other parallel to the chord (net chord load). It is to be noted from Fig 50a that the drag component or net chord load acts toward the leading edge of the wing. In the low incidence condition, Fig. 50b, the drag or chord component acts back. Thus in high incidence the chord component is considered negative and in low incidence positive.

The ratio of net chord component to net beam component is always zero in inverted flight (in which condition it is assumed there are no chord loads). In low incidence the ratio is always taken as 0.15 as this is fairly close to the true value for all airfoils. In high incidence the ratio of chord component to beam component may be obtained from Table 15 for commonly used airfoils. For sections not listed in the table the ratio may be obtained from the formula:

$$C/B = \tan(\cot - 1L/D - i)$$

where C/B is the ratio of chord component to beam component

i is the angle of attack when the center of pressure is at its most forward location.

L/D of the wing at the angle of attack, i, found just above

Example: Clark Y—to determine the ratio in high incidence

$$C/B = \tan(\cot - 1L/D - i)$$

i = 14 degrees for most forward location of C. P.

L/D at angle i = 14° is 9.9

From tables of trigonometric functions: the angle whose cotangent is 9.9 is 5¾ degrees.

C/B = Tan(5¾ — 14)° = — 0.144 which is the value listed in Table 15 for the Clark Y airfoil.

The Department of Commerce, the Army and the Navy all advise that the wing analysis should be made in the following manner.

1—Compute or estimate the gross weight of the plane.

2—Compute the effective span of each wing.

3—Compute or estimate the dead weight of the wings.

4—Compute the relative efficiency of the wings. (for biplanes.)

5—Compute the normal gross beam load on each wing.

6—Compute the normal net beam load on each wing.

7—Compute the normal chord load on each wing.

When this has been done the loads on the wing are distributed between the spars and the moments and reactions found. The stress in each spar, strut and wire of the wing cellule is solved for and a member strong enough designed to take each stress.

The computations of the above for the conventional type of design may be made as follows:

1—The gross weight as taken from the General Data gathered previously.

2—The effective span of a wing of constant chord and section is the distance from wing tip to wing tip, less that portion of the length, if any, that is covered by the fuselage and nacelles, and an allowance for tip loss. The effective semi-span $S_e$ in Figs 51 and 52, is one-half of the effective span, $L_e$. The entire span of the airplane is not effective because at the tips the air forces are greatly reduced. This is caused by the air slipping off the tips. The wing then does not receive the full force of the air in this region. The method of determining the decrease in effective span to allow for tip loss is shown in Fig. 51 for externally braced and in Fig. 52 for internally braced wings.

For externally braced wings a length equal to ¼ of the overhang ($0.25L_t$) is subtracted from the semi-span to obtain the effective semi-span; for internally braced wings a length equal to 1/10 of the tip length ($0.1L_t$) is subtracted. In the latter case $L_t$, the tip length, is equal to the chord for rectangular wings and for tapered wings it extends inboard till its length just equals the chord at that section.

The length of span occupied by the fuselage and nacelles is subtracted directly from the actual span to obtain the effective span.

3—The dead weight of the wings as taken from the General Data.

4—The relative efficiency of the wings is determined from Fig. 53. This figure gives the ratio of the normal unit load on the upper wing to that on the lower wing as a function of the gap/chord ratio and stagger in degrees. When the wings of a biplane are close together the upper wing interferes with the lower wing destroying some of its lift. Thus the upper wing is more effective for low gap/chord ratios. Staggering the wings positively (moving the lower wing to the rear) makes the upper wing even more effective. It is

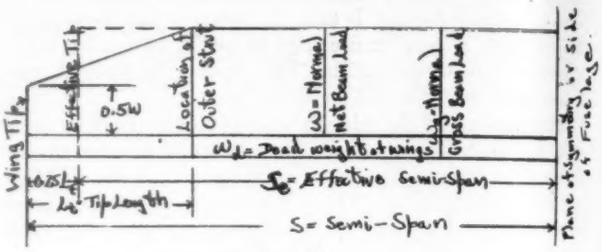



Fig 51.

preferable from a structural view-point to have both wings equally effective. It is not important enough a consideration however to interfere with vision or accessibility to the cockpit.

When two wings of different airfoil sections are used the chart may be used if the wings have about the same characteristics. With other combinations a wind tunnel test must be made or a very complicated theoretical study.

In using Fig. 53, the gap/chord ratio and the stagger are measured on a vertical section midway between the side of the fuselage and the effective tip of the shorter wing. The same relative efficiency shall be used for all flying conditions.

5—The normal gross loads for each wing are to be obtained from the formulas:

$$W_{ug} = \frac{W_g}{eL_u + L_l} \quad \text{and} \quad W_{lg} = eW_{ug}$$

Where $W_g$ is the gross weight of the airplane in pounds

e is the efficiency of the upper wing as obtained from Fig. 52

$L_u$ is the effective span of the upper wing in inches

$L_l$ is the effective span of the lower wing in inches

$W_{ug}$ is the normal gross beam load on upper wing in lb. per in. run

$W_{lg}$ is the normal gross beam load on the lower wing in lb. per in. run

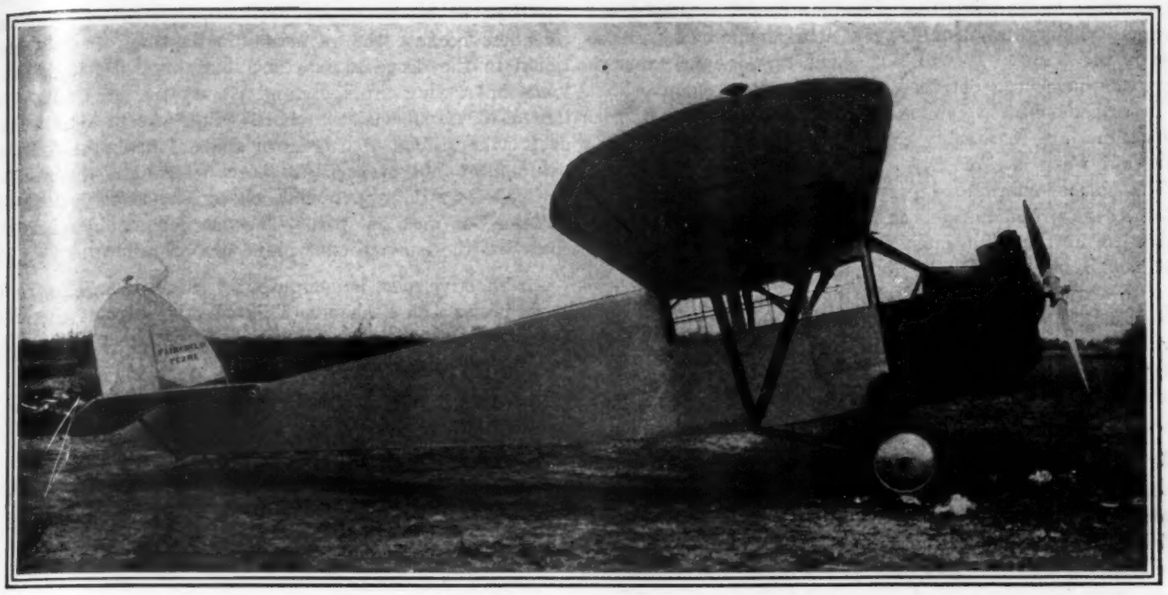
$W_g$ may be taken as half the gross weight and $L_u$ and $L_l$ as the effective semi-spans in $S_{eu}$ and $S_{el}$ if desired.

6—The normal net beam loads, $W_u$ and $W_l$, are obtained by subtracting the dead weight of the wings $W_d$ in pounds from $W_{ug}$ and $W_{lg}$, respectively. The dead weight per in. run of wing is found by dividing the total wing weight (this includes struts and wires) by the total span of the wings in inches before any decrease due to tip loss is made. In other words the actual span is used and not the effective span.

Then $W_u = W_{ug} - W_d$ and $W_l = W_{lg} - W_d$

In designs where the chords of the two wings are appreciably different a dead weight per each wing must be figured separately. This is seldom the case however.

When the normal net beam loads have been found it is advisable to check the work up to this point. This is done by



Fairchild Cabin Plane (Wasp)
as used by the Canadian Transcontinental Airways

# Reserve Power

RESERVE POWER in all aircraft is of great importance, and a necessity in commercial aviation. It provides a greater factor of safety, increased dependability, and longer life. An important step in American commercial aviation of 1928 will be recognition of the factor of RESERVE POWER.

"WASP" engines in the Fairchild monoplanes of the Canadian Transcontinental Airways provide the necessary RESERVE POWER. Quick take-off, with the combination skis and pontoons with which this ship is equipped, is vitally essential in the transportation of the Air Mail from the mouth of the St. Lawrence River to Quebec.

THE
**PRATT & WHITNEY AIRCRAFT CO.**
HARTFORD CONNECTICUT

## DEPENDABLE ENGINES

multiplying the normal net beam load on the wings by their effective spans and adding to these quantities the weight of the wings. This total should very nearly equal the gross weight of the plane. It will not equal this weight exactly as our loads have been obtained alternately from calculations based first on the effective spans and then on the actual spans. If the weights are reasonably close we may rest assured that thus far our work is correct.

7—The normal chord load per in. run on each wing shall be taken as the proportion of the normal net beam load given in Table 15 in the high incidence, as 15 per cent. of the normal net beam load in the low incidence condition, and as zero in inverted flight. In the high incidence condition this load shall be assumed to act towards the leading edge. In low incidence it shall be assumed to act towards the trailing edge. The chord load along the wing is assumed to be constant in amount—that is, there is no allowance made for tip loss.

### Application of Rules to Non-Conventional Designs

The foregoing rules may be applied directly to a biplane design with rectangular wings. If the design is a monoplane the rules become somewhat simpler as beam and chord loads need only be figured for one wing and Fig. 53 on efficiency does not enter the calculations. This of course applies to a rectangular wing monoplane.

If the wing is tapered the foregoing rules will have to be modified as the load per inch run varies all along the span. There are two forms of tapering, one in which the wing is tapered in plan form, secondly, when it is tapered in thickness ratio only, and thirdly the wing is tapered both in plan form and in thickness ratio.

a) A wing is tapered in plan form only when all sections of the wing are geometrically similar, that is, the camber or thickness ratio (the maximum depth divided by the chord) is the same for each section. Thus the wing is thinner at the tip than at the root but yet is not considered tapered in thickness because the reduction in depth is directly proportional to the decrease in chord length. In determining the loads on a wing tapered in plan only the procedure is similar to that for constant chord wings except that areas are dealt with instead of lengths or spans. After the distribution per square foot of area has been determined the results are multiplied by the appropriate chord lengths to find the values of load per inch of span. The detailed modifications in the rules for the conventional plane are as follows:

An effective area is computed in place of an effective span as in paragraph 2 above. This effective area is the area inboard of the effective tip which is obtained from Fig. 51 and Fig. 52 the same as before.

The dead weight of the wings is computed in pounds per square foot by dividing the total weight of the wings $W_d$, by the total area A of the wings, that is $w_d = W_d/A$

The formulas for the normal gross beam load are modified as follows:

$$w_{lg} = \frac{W_g}{eA_u + A_l} \quad \text{and} \quad w_{ug} = e w_{lg}$$

Where $A_u$ and $A_l$ are the effective areas in square feet of the upper and lower wings, respectively, and $W_{ug}$ and $W_{lg}$ are expressed in pounds per square foot. In a monoplane, of course, the gross normal load per square foot would equal the gross weight of the plane divided by the effective area of the wing in square feet.

The normal chord load and the normal net beam load are computed as before in paragraphs 6 and 7, except that quantities are in pounds per square foot instead of pounds per inch run.

b) A wing is tapered in thickness ratio only when it is rectangular in plan form and the thickness varies from foot to tip. When the thickness ratio of a wing varies it is assumed that the air forces and the dead weight of the wing per square foot vary in proportion. The beam and chord loads for such a wing are found by computing the dimensions of an "equivalent wing" assumed to be of constant thickness ratio and applying the rules given above for a wing tapered in plan form only. The span of the equivalent wing is assumed to be the same as that of the true wing, but the chord at any section is the chord of the true

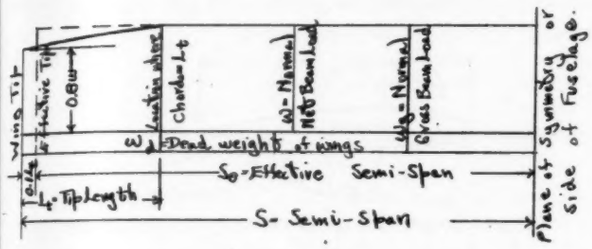
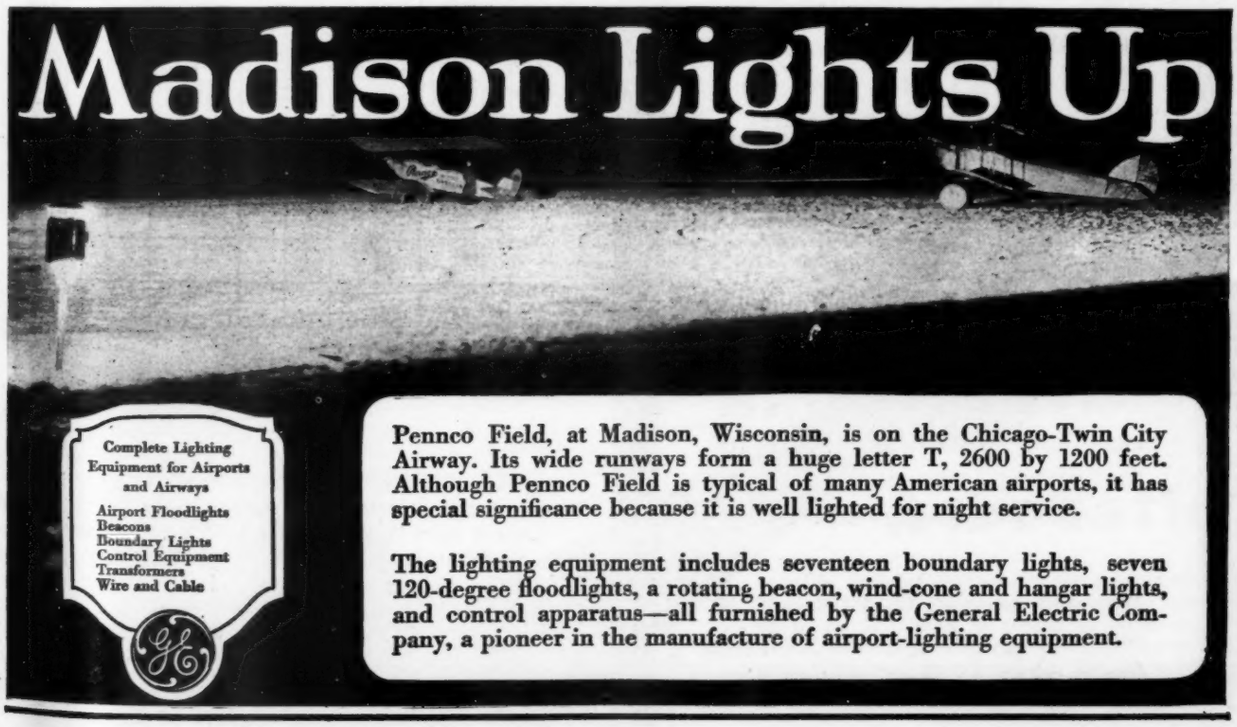



Fig. 52

wing at the section multiplied by the thickness ratio at the section and divided by the thickness ratio at the root of the wing. The equivalent wing will be tapered in plan form. If the true wing is rectangular and the thickness ratio has a straight line variation (the usual case) the chord of the equivalent wing will have a straight line variation.

c) When the wing is tapered in both plan and thickness the same procedure as in (b) must be carried through. That is, an equivalent wing must be found. In this case it is important, since the chord varies all along the wing span of the true wing, to multiply the thickness ratio at any section by the chord at that section and divide by the thickness ratio at the root. This is just what we did in (b) but as the wing was rectangular and the chords at all sections equal the chance of error was less.

The distribution of the beam load along the span is shown by curves A, B, C in Figs. 51 and 52. Fig. 51 applies to conventional, externally braced biplanes where the outer strut point is approximately one chord length from the wing tip. In this case the tip length extends from the strut location outward and the load tapers from its full value at the strut point to 0.5 of this value at the wing tip. This tapering is an allowance for tip loss due to the air slipping off the end of the wing in flight. This loading is to be used for the investigation of all stresses inboard of the outer strut point. In computing the design loads for those sections of the spars between the outer point of inflection of the outer bay and the wing tip, the bending moments obtained from the loading represented by curve A, B, C of Fig. 51 should be increased by 30 per cent. The design loads in the outer struts and outer bay lift wires should be increased 15 per cent. In addition the axial load in the spar between the outermost point of inflection and the outer strut should be figured from the loads in the lift wires and outer strut after they have been increased 15 per cent. The axial load in the spar inboard of the inflection point is based on the uncorrected loads in the strut and lift wires. The increase of 30 per cent in bending moments, and of 15 per cent in strut, wire and axial loads at the strut point is due to the fact that each shape of wing tip affects the wing loading differently. There is still too little known about tip loss to take any chances and so to be on the safe side the loads are arbitrarily increased. It is hoped that some day all tips will be about the same shape and pressure distribution tests now being made will have progressed far enough to allow an absolutely correct wing



Madison Lights Up
Complete Lighting Equipment for Airports and Airways
Airport Floodlights
Beacons
Boundary Lights
Control Equipment
Transformers
Wire and Cable
Pennco Field, at Madison, Wisconsin, is on the Chicago-Twin City Airway. Its wide runways form a huge letter T, 2600 by 1200 feet. Although Pennco Field is typical of many American airports, it has special significance because it is well lighted for night service.
The lighting equipment includes seventeen boundary lights, seven 120-degree floodlights, a rotating beacon, wind-cone and hangar lights, and control apparatus—all furnished by the General Electric Company, a pioneer in the manufacture of airport-lighting equipment.
711-20
GENERAL ELECTRIC
GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

For The Discriminating Purchaser:

THE AIRSEDAN

AIRLINE OPERATORS will find this plane meets with all their requirements. The cabin has exceptionally comfortable seats for four large passengers and the pilot's visibility is unexcelled.

PRIVATE OWNERS will approve of the fine appointments which are selected to satisfy the most critical taste.

CORPORATIONS desiring to keep step with the progress of the times will find that here is an efficient and up-to-date vehicle for transporting executives and personnel to widely separated branches.

We will be glad to assist you in determining the adaptability of this fine product to your requirements.

BUHL AIRCRAFT COMPANY
Marysville Michigan


tip loading to be formulated. Then no arbitrary increase will be necessary.

For externally braced monoplanes or biplanes, where the outer strut point is at a distance materially greater than one chord length from the tip, the following method of loading must be used. As before for stresses inboard of the outer point of inflection the loading curve of Fig. 51 must be used. For stresses outboard of this inflection point, instead of increasing the loads obtained from Fig. 51 by 30 and 15 per cent., the loading of Fig. 52 must be used. This is a more severe loading and gives stresses in excess of Fig. 51 for points outboard of the inflection point. The tip length in the loading of Fig. 52 extends one chord length in. In the case of tapered wings it ends at the section whose chord just equals its distance from the tip. From this point the loading tapers from its full value to 0.8 of this value at the tip. The loading of Fig. 52 must be used for moments and axial load on the spar from its outer point of inflection to the tip, and for the loads in the outer struts and flying wires.

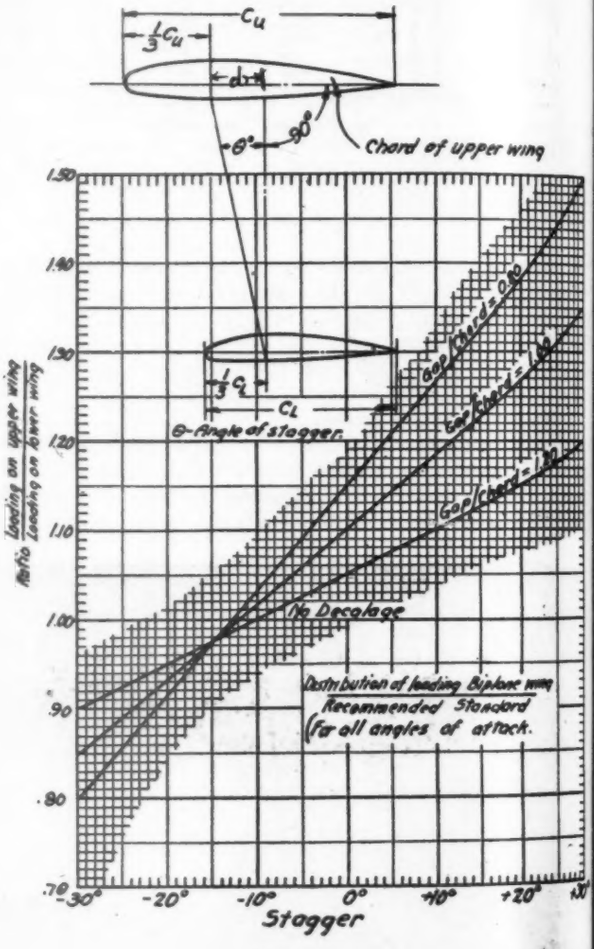



Fig. 53

For internally braced wings (the full cantilever monoplane) the load curve represented in Fig. 52 should be used. This loading is the most severe for this type of plane.

When the proper loading has been decided for the plane under consideration it is best to assume a load of 1 lb. per inch run and to solve for reactions and moments on the spar under such a load. When the actual spar loads are found for each flight condition the moments and reactions obtained for a unit load may then be multiplied by the actual loads for each condition. This saves a lot of work as the spar has only to be solved once. Chapter 2 of this series indicates how to solve spars for moments, shears and reactions.

After the normal net beam load on a wing has been found it is necessary to distribute this between the spars. With two-spar construction the beam load on the wing is assumed to act at the center of pressure and must be divided between the spars in inverse proportion to their distances from the center of pressure. From Table 15 we have already listed in our General Data the center of pressure locations for the various flight conditions. Likewise the spar locations are listed in per cent. of chord from the leading edge. Then for any condition:

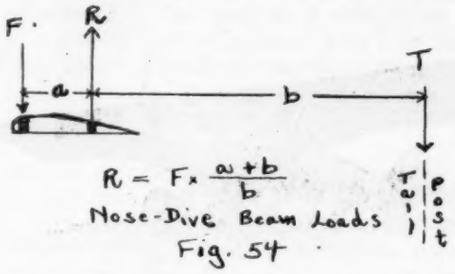
$$\text{Front spar takes} \frac{\text{Rear spar location — center of pressure}}{\text{Rear spar location — front spar location}} \text{ per cent.}$$

$$\text{Front spar takes} \frac{\text{Center of pressure — front spar location}}{\text{Rear spar location — front spar location}} \text{ per cent.}$$

The net normal beam loads on the wing are multiplied by the above percentages to obtain the proportion of loads on the front and rear spar. These percentages will of course vary for each flight condition as the center of pressure varies. For high incidence and inverted flight the center of pressure is assumed the same but the inverted flight loads act down and the high incidence loads up. Thus far no load factor has been introduced. The loads on the spars in each condition must now be multiplied by the load factor for that condition. These factors have been listed in the General Data and are now handy. The loads which we now have for each spar for each flight condition is the actual beam load. If we have solved our spar for a unit loading we may now multiply the results by these actual beam loads. In this manner we have the moments and reactions along each of the spars for all flight conditions. If our plane is such that the outboard reactions and moments are to be increased 15 and 30 per cent. we may now do that and thus obtain the design load in spar at the strut point and the design load in the outer struts and lift wires.

Application of Chord Loads to Internal Wing Truss.

The chord loads are considered as concentrated loads at the panel points of the internal wing truss or drag truss as it is more commonly called. The load at each such joint is



Nose-Dive Beam Loads
Fig. 54

the product of the normal chord load per inch run at the joint and the distance between midpoints of adjacent panels of the internal truss. For this purpose, the extreme wing tip shall be considered the midpoint of a truss panel.

Thus far we have discussed the method of obtaining the loads due to high incidence, low incidence, and inverted flight. The condition in which the plane is nose-diving must be investigated also. As discussed in Chapter 3 it is quite difficult to know just what is happening in a dive. For purposes of stress analysis however the following conditions must be met.

In the nose-dive condition the beam loads on the front spars must be the same as the design ultimate loads on those spars in the inverted flight condition. In other words after the

*Two Books Indispensable to the Aviator*

**THE AEROPLANE SPEAKS**

**By Captain Horatio Barber**

NEW 1928 REVISED EDITION NOW READY

This work, adopted by the United States Government for use in the instruction of its aviators, is a simple, non-mathematical yet accurate handbook on elementary and advanced flying, including chapters on flight, stability and control, rigging, propellers and maintenance. It is story-like in its simplicity and is entirely comprehensible to the layman. Professor Alexander Klemin, of the Daniel Guggenheim School of Aeronautics at New York University, says in his foreword: "It is almost a work of genius in its clarity and vividness. Everything is simple and accurate."

*9th Printing. 50 full page illustrations showing types of aeroplanes. 85 sketches and diagrams. $3.50.*

*By* THE SAME AUTHOR

**Aerobatics**

This work on aerobatics, as the author terms stunt flying, is of equal importance to student and instructor. Major W. G. Kilner, at present an active executive officer of the Air Corps at Washington says in his introduction: "I have had occasion many times to refer to this text in order to straighten out for myself some point in aerial acrobatics." Many illustrative diagrams.

*Says General William Mitchell:* "I have nothing but praise for this excellent work — a dual purpose book, valuable alike to student and instructor."

*$3.00 at all booksellers or the publishers*

**ROBERT M. McBRIDE & COMPANY**

***Publishers***

**7 West 16th St., New York**

THANK YOU *for mentioning* AVIATION

# The AIRMASTER COUPE

## with LEBLOND MOTOR

*CLOSED CABIN — FULL VISIBILITY — EASY CONTROL — ABSOLUTE SAFETY — 400-MILE CRUISING RANGE.*

THE AIRMASTER COUPE and its brother ship, The YOUNGSTOWN YOUNGSTER, are built to meet popular demand for personal ships with style, vigorous power and flexibility.

A ride in either of these beautiful monoplanes, specially designed for the convenience and comfort of the rider, with their surplus of smooth-flowing power and quick response to stick and rudder, will mark a new chapter in your air experience. *Dealership in a few choice territories are open. Write — or wire — for full information.*

| THE AIRMASTER COUPE | THE YOUNGSTOWN YOUNGSTER |
|---|---|
| *Three-place Cabin* | *Two-place Cabin* |
| *LeBlond "Ninety" Engine* | *LeBlond "Sixty" Engine* |
| *Span 36 feet* | *Span 30 feet* |
| *Length 23 feet* | *Length 19 feet 9 inches* |
| *$3,000 Flyaway* | *$2,375 Flyaway* |
| *(Price subject to change)* | *(Price subject to change)* |

**OHIO AERO MANUFACTURING CORPORATION**

**Youngstown, Ohio**

*The Ohio Aero School In Connection With Factory. Catalog on Request.*


load factor and whatever other corrections were required have been included in the inverted flight loads on the front spar these loads are taken as the diving loads on that spar. No further load factor is introduced. Then to obtain the loads on the rear spar moments are taken about the tail post. This is illustrated in Fig. 54. For equilibrium these loads are acting upward and a load is acting down on the tail equal to the difference in the spar loads. Thus summation moments and summation V is obtained and as there is no force in a horizontal plane the whole system balances.

The upward load on the rear spar is distributed in the usual manner. That is to say we may multiply the moments and reactions obtained by the unit load on the spar by this new beam load on the rear spar and obtain the actual moments and reactions.

The chord components of the air load on the wings is equal to the net weight of the airplane. The load per inch run may be determined by dividing the net weight of the plane by the actual span of the wings. The net weight of the plane is the gross weight minus the wing weight.

For internally braced cantilever monoplane the loads specified above must be increased 30 per cent.

Where dead weights are carried by the wings such as landing lights, wing-tip floats or skids, or other items that weigh little and are in such location that they do not affect the stresses much, their weight may be included in the dead weight of the wing. Loads that are large or are so placed that they would cause an appreciable change in the computed stresses such as gas tanks, engine nacelles, or wing tip floats far outboard of a strut point must be separately provided for. If the load is concentrated at one point it must be proportioned between the spars at that point in inverse proportion to the distance of its center of gravity from the spars. These spar loads must then be treated as concentrated loads and the effect on the stresses calculated. If the unit is spread over a considerable extent of wing area, like a gas tank or a wing radiator, it shall be considered as composed of concentrated loads at its points of attachment to the spars, or as a uniformly distributed load if it is attached to the spar at sufficient points. If a dead weight is supported in such a manner that it may be considered as uniformly distributed and extends over two-thirds or more of a wing panel it may be considered as distributed over the entire panel. This makes the computations considerably easier. When the unit is one of variable weight such as a gas tank the primary analysis must be made with the maximum load and then a rough check must be made with the light weight to see that nothing is designed by this condition.

The weights of all dead loads shall be assumed to act in the beam direction in the high and low incidence and inverted flight conditions, and in the chord direction in the nose dive.

### Summary.

This chapter comprises very nearly all the rules of wing analysis. In the next chapter a sample analysis will be worked out to illustrate the operation of these rules.

*Copyright Alexander Klemin*

*To be continued in the next issue of* AVIATION

## Potomac Flying Service

*Continued from page 1147*

taxi companies for the Potomac Flying Service to pay the taxi fare to the airport of any one who will take an airplane ride. Stickers announcing free transportation to Hoover Field are on the cabs of that company. Whenever a cab driver secures a tourist who wants "to see" Washington, there usually follows an indirect suggestion for a flight over Wash-

ington...."especially when it ain't gonna cost you a thing to get out there". The suggestion works quite often.

It is a well-known fact that tourists are sure customers for cards of the interesting places they visit if for no other reasons than to send them to their friends back home. Postal cards were printed, one showing a four place cabin plane and another with the picture of Hoover Field. Nearly every person taking a flight buys two or more of those cards. First it is a source of revenue and then it is one of the best forms of advertising throughout the country.

*Personal Contacts.* Two men were employed for one purpose only—to create a personal relationship between the men and women who come in contact with prospective flight customers and the Potomac Flying Service. These men are known as contact men. Their business is to create good will towards the company. They visit the hotels, talk to the clerks, interest the tourist agents, arrange for free rides for all those who are selling the flight tickets, volunteer to help in the sale of the tickets, show themselves ready to give their time in order to stimulate sales in a particular place where the revenue from the sale of tickets is lagging.

They meet the buses, distribute the leaflets, talk to the bus drivers, chat with the taxi drivers and all the time they talk "Fly Over Washington". That's the slogan of the contact men. Whatever they do and say, it is always to get more people to fly over Washington. The personal interest these contact men show in the ticket sales made by various places and persons has a beneficial effect. It is a proof to the ticket sellers that the Potomac Flying Service is not only interested in distributing their tickets but in helping them to make money for themselves. What the leaflet and other advertising matter misses the contact men complete by their genial and helpful personality.

*Newspaper Publicity.* "We can get enough business without any circus publicity. That does not mean that we do not believe in newspaper publicity," stated Mr. Nash. "I believe that the newspaper publicity we received from the Washington papers brought out many residents to take a flight and also brought us many students.

"We are careful, however, what kind of publicity goes into the papers. I have no doubts that those 'stories' about amazing stunts, tricks and drops only intensified the belief of the average man that for flying one must have a special mental and physical equipment. What we are trying to put across is that any one with good eyes and common sense can fly. Of course some think that even for a sight-seeing flight one has to be a special type of person. And I do believe that some of the 'Stunt' publicity is responsible for that belief.

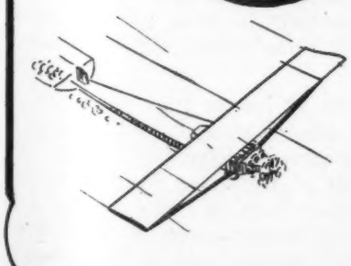
### Give Reporters Free Rides

"The newspaper reporters are always given the latest information regarding new types of planes, new inventions, and prominent people who are taking up flying. Very often we give them free rides. Recently one of the reporters was given a ride to New York. This way he got a better idea about flying and therefore became a better reporter about flying."

Mr. Berliner realized that the favorable impression created by the various forms of advertising and publicity must be sustained and even strengthened after the prospective passengers or pupils arrive at the airport.

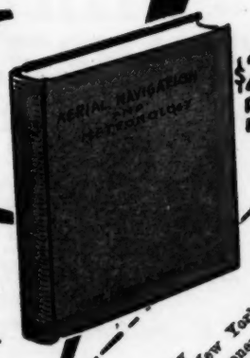
The company erected a small but attractive combination office and waiting room of light brown brick with white trimmings. This pleasant looking building is the first thing that strikes the visitor. On entering the building the visitor finds a neat waiting room partitioned off from the office by a railing. Clean chairs, a table with magazines, and a spring water fountain are there for the visitors. Not a trace can be found of broken spark plugs, split propellers, old carburetors, swabs of oil waste or greasy flying togs frequently found in the


Learn to Fly Safely



To be a successful cross country pilot you must know Navigation and Meteorology. You cannot pass that coming examination without it.

Written in plain language which you can understand with all unnecessary matter eliminated.




$2.50 POST-PAID

CAPT. Lewis A. Yancey
425 West End Ave.
NEW YORK CITY

Captain Lewis A. Yancey,
425 West End Ave., New York City.
Here's my check or money order. Send me your book postpaid.
Name .....
Street .....
City ..

# Keep Abreast of
## *Aeronautical Developments*

WE have prepared a booklet on Aerol Shock Absorbing Struts that is of interest to every man connected with flying. A copy of this is yours for the asking.

These perfectly controlled telescoping struts swallow the landing impact and insure smooth taxiing over almost any ground. Forced landings are far less hazardous on Aerol Struts. You should get the details contained in the booklet. Write for it today.

CLEVELAND PNEUMATIC TOOL CO.
3737 E. 78th St., Cleveland, Ohio

AEROL shock absorbing STRUT



# *Plane Talk*

*— Tags like these, attached to every Travel Air Ship, are filled out and returned by the owner on arriving at destination.*

FLIGHT RECORD

From Wichita to FARGO, N.D.
Left Wichita Mo. 3 Day 4 Hour 12:45
Arrived FARGO Mo. 3 Day 5
Hour 3:40 Distance 800 miles.
Flying time—Hours 7 Minutes
Average speed - - - 114.00
Amount of gas used - 51 GAL.
Amount of oil used - -
Interesting and unusual happenings enroute:
FLEW TO HOLBROOK KS. & CARRIED PASSENGERS SUNDAY P.M. HOPPED UP TO ABELINE KAN. TO STAY ALL NIGHT CAME UP FROM ABELINE TO FARGO IN 6 HOURS. HAVE FLOWN 2100 MILES THIS WEEK
Signed E.M. CAMPBELL
Address FARGO. N.D
Business FARGO FLYING SERVICE

wooden shanties which represent the office and waiting rooms at some airports.

On the side of the building which faces the field an open porch was added from which the waiting visitors can watch the operations on the field. Benches and chairs are placed around the porch and frequently the table with the magazines is moved out for the convenience of the people.

During rush days the porch was so crowded with waiting men and women that often those who came last boarded the planes ahead of their turn. A great dissatisfaction was often the result and frequently some persons asked for the return of their money. It was not only the loss of the revenue but

*Left, Courtesy card. Below, Covers of the leaflet distributed.*

the attendant unfavorable publicity that was bound to result suggested to the officials of the company the employment of a special person to attend to this particular situation. A young man was employed to stand near the gate separating the porch from the field. His duties are to keep the passengers in their correct order, let them through the gate and lead them to the plane they are to board.

Another of his duties, a semi-official duty it can be called, is to keep the waiting passengers entertained so that the time they spend in waiting passes more quickly. He tells them about the different types of planes on the field, and their engines. He mentions some interesting details about the pilots and officials of the company. He relates some personal experiences about the notable persons he has conducted toward the planes for rides. And generally succeeds with his stories to keep their minds off the prolonged waiting time.

As a result of this forethought and watchfulness in spreading the message of flying over Washington and the solicitous management of the people after they arrive at the airport, the Potomac Flying Service can point to a record of nine thousand sight-seeing passengers in three months and six thousand in the subsequent three months after the weather had become cooler.

The company also derives an income from renting planes to a photographic concern which contracted with the Virginia State Development and Conservation Commission for the photographing of certain parts of the state. Many trips were also made for motion picture concerns and news reel companies to transport films and photographers to various cities.

The cautious and careful policies used in the passenger work is also pursued in the management of the flying school

which is conducted at the same field. On the receipt of an inquiry regarding the school first, a two page leaflet is sent in reply with a detailed explanation of the various requirements for different license, the cost of the course and a statement regarding the requirement of a breakage bond. If space would permit it would be interesting to give verbatim the wording of this folder. It promises no position, or even hints at such a possibility. No promises are made of untold riches or a suggestion made about the ease with which one can learn to become an expert pilot.

As a result of the lack of flowery promises, the responses to the circular are in a smaller proportion than some other concerns secure. But those who usually are interested write again, and if from the tone of their letter an inference can be drawn that they are earnest, they are sent a special catalogue.

This catalogue again illustrates the effort of the Potomac Flying Service uses in giving the correct and best impression of its business without any extreme promises. The covers of the catalogue are of a sky-blue color with the name of the company and the school printed on the front cover. On the inside is a general review of flying and a suggestion as to its future possibilities. Then follows a description of the ground course followed by a description of the flying course. Space is devoted to the requirements for certain types of licenses, the equipment of the field, the personnel, and then about Washington and its various aeronautical interests. Again the tuition fees are stated and it ends up with a warning for the prospective student to make certain that a physical examination is given him by a doctor authorized by the Department of Commerce. The final statement reads, "Do not be misled by glowing statements of highly remunerative work without understanding that remuneration is only obtained as the result of expensive and intensive training."

### Cooperating with Tourist Companies

As a result of such methods the flying school has an enrollment averaging 25 students who have the time and money not only for the initial course of 10 hours but to continue for a higher license or to buy their own plane.

The Potomac Flying Service is now making arrangements with tourist companies throughout the United States to make a flight over Washington as part of the itinerary of every tourist who is under their guidance. As the tourist agency maps out the show-places the customer is to visit in Washington, one feature will be a flight over Washington in one of the Potomac Flying Service planes.

Another plan now being formulated, is a tie-up with the tourist agencies for cross-country trips. If a tourist or group of tourists wish to go from Washington to New York or to any other city by plane the agency will have the cost of the trip so handy that it can immediately quote the price without telegraphing.

The scale of prices which are being worked out are based not on a single passenger but on the type of plane. When a tourist wishes to go anywhere in a two-seater plane he charters that plane but if he wishes to use a four place cabin job he has to pay for the use of that plane and not as a single passenger. The prospectus that is being worked out for this particular business includes the description of the plane, number of passengers it can carry, range, cruising speed, baggage allowances, lay-over charges for day and night, plane, miles and price for chartering plane.

During the coming summer the Potomac Flying Service expects to double its number of sight-seers. As a closing remark it may be interesting to state that in December and January, two of the coldest months in Washington, the Potomac Flying Service carried close to 1000 passengers each month.

*Easy adjustment*

The Bendix-Laddon Wheel and Bendix 2-Shoe Servo Brake form this compact unit. Adjustment is simple; entirely from outside.

*Now in production in standard sizes*

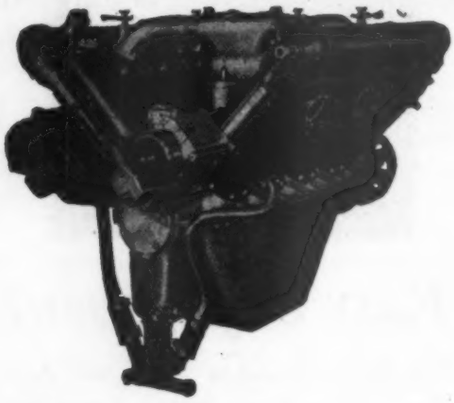
(Fully protected by patents and applications in U. S. and abroad)

BENDIX BRAKE COMPANY
*General Offices and Plant: South Bend, Ind.*
Division of Bendix Corporation, Chicago

**BENDIX 4 BRAKES**
FOR SAFETY

Tachometer Driving
at its best with
S.S.WHITE
FLEXIBLE SHAFTS
Made in many styles and sizes for a wide range of applications.
Steady, Sure, Silent transmission of power
The S.S.White Dental Mfg. Co.
Industrial Division
152 West 42nd St. New York, N.Y.
S.S.WHITE FLEXIBLE SHAFTS
Write for this book
Sent free on request

**Aircraft Manufacturers & Dealers**



**WE own and offer for sale for immediate delivery a large stock of 150 H.P. and 300 H.P. Wright Hispano-Suiza motors and parts. Don't neglect the opportunity. Write or wire for prices. State quantity desired.**

**Southland Jobbing House**
**Norfolk, Va.**

THE
AEROPLANE
Edited by C. G. Grey

*The Leading European Aircraft Paper*

Publishes every week the essential news of the developments of flying all over the World.

Illustrates and describes regularly the latest aircraft and engines of all nations,—with the fullest possible details and specifications.

American aeronautical people who want to know what is doing in Europe should subscribe to THE AEROPLANE.

Subscription for one year $8.50, post free from "THE AEROPLANE" Office, 175 Piccadilly, London, W.1., England.

# Side Slips

By ROBERT R. OSBORN

Mr. N. V. C. tells a story, worth passing along, about a pilot who was recently assigned to ferry a very slow plane on a rather long cross-country trip. He had warmed the engine up, waved the chocks away from the wheels and was about to start out when a final inspection of his instrument board showed that there was no clock mounted thereon. "Say," he said, "There's no clock in this ship and I haven't my watch with me. How am I going to tell time?" None of those standing about the plane had any suggestions to offer, so finally he said to a mechanic. "Well, I'm not going off without some way of keeping track of time. Run on in the office and get me a calendar."

• • • •

Mr. C. W. H. of St. Louis, inquires about a recent article in AVIATION concerning the new Ford airplane engine, in which was the statement, "the bore of this engine is 4⅞ in. when throttled down to 1400 r.p.m." The only possible explanation that occurs to us offhand, C. W. H., is that the engine becomes more bored when it is held down to the low speeds.

• • • •

Because of the worries of the newspapers and various governmental bodies, the King of Belgium has given up an airplane trip he expected to make to a foreign capital.

Revision of an old saying,—"Uneasy flies the head that wears a crown."

• • • •

Casey Jones turned up late at a party recently with badly blistered and cut hands and a good story to explain how he got them in that condition. He had made a trip over to New Jersey from New York in a cabin monoplane. No one was to come back with him on the return trip and not having an engine starter on the plane, he enlisted the aid of a nearby farmer for help in getting started. The farmer was placed in the cockpit to operate the switch while Casey swung the propeller. For forty minutes he swung the prop, and primed, loaded and cleared the engine,—tried different carburetor settings and different ways of swinging the propeller, without even a hiccough out of the engine. At the end of that time he was about to give it up altogether when he discovered that his farmer assistant had been turning the gas cock off and on all of the time.

• • • •

A New York manufacturer of women's dresses is boasting that he recently shipped two hundred gowns to Toronto by airplane. To our way of thinking a load of two hundred gowns is hardly worth mentioning, either from the standpoint of weight-carrying for the airplane or as a news item. If the manufacturer had only thought to have sent a beautiful actress on the trip with the announcement that she had taken part of her wardrobe along, he might have gotten some real publicity out of it.

• • • •

The Interpid Aviator was in the office the other day and commented on the prediction of Major General McBrien, president of The Canadian Aviation League, that in the not far distant future we would have airplanes which would travel 1,000 m.p.h. He says that this is entirely possible, in his opinion, as he has a plane now which makes about an hundred miles per hour forward and about 900 m.p.h. in the other directions, and if he could only straighten it out a bit, this prediction would be realized right away.

# FOREIGN NEWS

*By Special Arrangement with the Transportation Division Bureau of Foreign and Domestic Commerce*

## *A Japanese Flying School*

Under authorization of the Japanese Government, the Nippon Aviation School has been organized and courses in flying are now being given at the school's airport at Tachikawa near Tokio, reports Tamotsu Aiba, president of the school. The instructors are K. Ogawa and J. Fushimi, both of whom are experienced pilots.

French Nieuport and British Avro planes are used by the school as well as a Junen type plane designed and constructed

*A scene on the airport of the Nippon Aviation School near Tokio. Nieuport and Avro planes are lined up ready for flight, while a Junen type plane designed by the Japanese is shown in the foreground.*

by the Japanese, which is powered with a Hispano-Suiza 300 hp. engine. A score of students are enrolled for the courses, one of them being a young Japanese woman of 19.

## *French Air Clubs Hold Sixth Congress*

French air clubs recently held their sixth national congress at Lyons, it is reported. Conferences held were chiefly devoted to the discussion of the general conditions affecting French commercial aviation, resolutions being passed setting forth the policy of the organization of clubs toward these matters.

A request for government assistance in bringing about better training facilities for pilots was included in the resolutions passed. Other measures favored a provision for the study of conditions for furthering the air mail service, acknowledgment that more and better airports are needed in many of the provincial cities, and a request for an air service from London to Marseilles that would permit mail to leave the former city by plane at 9 P.M. and arrive in Marseilles at 6 A.M. the following morning.

## *German Makes Record Ascent in Glider*

In rising 1,869 ft. above his starting point in 45 min., Ferdinand Schulz recently set a new glider ascent record at Grunau, Germany. The glider altitude mark, which was made by Schulz last October, is 2,205 ft.; but this height was only attained after more than 4 hr. in the air, therefore the mark of 1,869 ft. in 45 min. is a new record for speed of ascent to such an altitude.

## *Mexico Now Has Aviation Department*

A decree creating a Mexican Government Department of Civil Aviation was recently approved by President Calles. The new department is to have jurisdiction over the development of commercial air routes, establishment of airports, and the opening of flying schools for civilian training.


MILESTONES OF PROGRESS

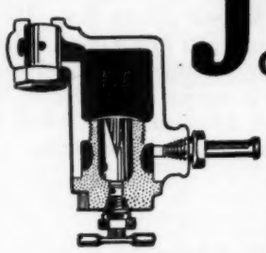
*When We Say "Tuesday" We Don't Mean "Friday"*

SWALLOW dealers have learned that they can depend upon delivery promises made by Swallow. Exact production schedules, made possible by the most modern manufacturing methods, insure "on time" deliveries to our dealers and customers.

Prompt deliveries mean satisfied customers — and more profits for the dealer. Write or wire us for more details regarding the money making Swallow dealership.

SWALLOW AIRPLANE CO.
WICHITA, KANSAS

JOBEL
GAS STRAINER



A real necessity for safety and smooth running. Clean gas is essential, with the Jobel strainer you can be sure it reaches your motor free from sediment or impurities.

**Specially Designed for the OX5 and OXX6 Curtiss Engine** and has been standard equipment for the past two years on the Waco planes. All materials in this strainer are in accordance with Air Service Specifications. Rigid construction throughout. We have also provided a draincock at bottom to permit easy cleaning without disturbing the installation. No changes of either carburetor or fuel line are necessary when installing this strainer or OX5 engines. Price, ready to install, each **$5.00.**

Order direct from this ad — Shipment will be made same day order is received.

OX5 Engine Manuals, 25c

**Nicholas-Beazley Airplane Company, Inc.**
220 No. English St., Marshall, Missouri

# AIRPORTS AND AIRWAYS

## *Garden City, Kan.*

***By Murriel Keiser***

With the erection of an airport, the installation of a Porterfield Flying School, and the organization of an N.A.A. chapter, Garden City has become a center of air travel in Southwestern Kansas. One winged calvacade flew into the airport shortly after its completion this spring, when five airplanes from Hutchinson, Kan., the largest group ever to fly over the city at one time, arrived for an over-night stop. The air tourists were entertained with a program which included dinner with the National Aeronautics Association members and a meeting with the local chamber of commerce.

The airport, situated just east of the city, is bordered by a four foot white lime ribbon which marks the edge of a 2,320 ft. by 2,640 ft. field. Twenty acres of sod near the administration building affords ample space for small planes to take off and land, thus preventing the necessity of traveling over plowed ground. Two flood lights are trained on the airport, and in addition a powerful beacon visible at a distance of 40 mi. stands on the site. The beacon, which is automatically controlled by an electric clock, develops 8,000,000 candlepower. The light rotates nine times a minute, and a 900 watt bulb is used.

A modernly equipped administration building offers convenient facilities for servicing planes. Gasoline, oil, and accessories may be purchased, while a rest room contains comfortable chairs, reading quarters, hot and cold water. Everything that contributes a share toward coziness is maintained for air tourists who make stops in the port. Other accommodating features of this administration building include a radio receiving set, a long distance telephone booth, and instruments for ascertaining weather conditions.

Interest in aeronautics has increased greatly since March 23 which marked the official opening of the Flying School. Captain Miller of the Porterfield Flying School in Kansas City, Mo., Lieutenant Boyd, who is serving as instructor, and Boccahine, mechanic, are using an American Eagle plane for teaching flying to the class of nearly a dozen students.

## *Chicago, Ill.*

***By H. H. Slawson***

Bud Gurney, air mail pilot of the Robertson Aircraft Corp., made the 278 mi. trip from St. Louis to Chicago recently in 1 hr. 54 min., thereby setting a new record, one minute shorter than the previous record of 1 hr. 55 min. also established by himself.

More than 100 boys of Tilden Technical High School have organized an Aero Club. Three shops have been allotted them for use after school and three instructors are aiding them in building model planes.

More than 1,000 persons have taken sightseeing trips over Chicago since the service was started Feb. 15, it is announced by officials of the flying service of N.A.T.

Rear Adm. William A. Moffett, chief of the naval bureau of aeronautics, has been appointed a member of the Chicago Aero Commission by Mayor Thompson. Hope is expressed that thereby the municipal flying field can be equipped with a $100,000 mooring mast for dirigibles.

Allen T. Spivey, owner and editor of the East St. Louis (Ill.) *Daily Journal*, used an airplane to stump the state during the primary campaign in which he was a candidate for the republican nomination for congressman-at-large. Where landing fields were not available, Mr. Spivey showered the electorate with printed appeals for support. His platform included a plank advocating "development of the air."

Airplanes of the Boeing Air Transport Co. flew a total of 122,026 mi. on the Chicago-San Francisco airway during March, according to W. A. Patterson, Chicago manager. They carried 51,000 lb. of mail, 1500 lb. of express and 122 passengers. Passenger miles flown totalled 105,117, which was a big increase over former months.

## *Elmira, N. Y.*

***By Wells Crandall***

A survey of business conditions within a 50 mi. radius of Elmira is about to be undertaken by the Elmira Association of Commerce Aviation Committee in conjunction with chambers of commerce of nearby towns and cities with view of getting a contract for a new air mail route stopping in this city. Emphasis is being placed on the ideal location of Elmira as a mid-point on the New York-Buffalo air mail route and the probable business forthcoming to a carrier.

Col. H. H. Blee of the Bureau of Aviation, Department of Commerce, spoke recently at a joint luncheon of service clubs, the Association of Commerce, and visiting municipal authorities. Recent developments of the national airways and air mail were discussed by the speaker.

Alfred Stanley, head of the Stanley Airways, Inc., is now representative of Waco in this district. Pilot Ralph Haynes, with the British Royal Air Forces during the World War, is employed by Mr. Stanley.

The Southern New York Flying Club was organized recently by Edward A. Mooers, former flight commander of the school of aviation at Brooks Field, Tex. When the membership of 50 is complete a plane will be purchased. Twenty-five members joined during the first few days. An instructor will be secured and instruction will be given all members, and it is planned to extend the course to include students not connected with the club.

Sherman P. Voorhees, chairman of the Aviation Committee of the Elmira Association of Commerce, has been appointed a member of the New York State Aviation Conference by Mayor Charles G. Hanna of Syracuse, who is chairman.

A total of 1600 passengers has been carried at the airport since the field was opened last September. Plans are now being made for a more thorough grading and seeding of the field. The runways are in good condition and flights have averaged one per day all winter, as well as a number of student flights. The hangar is being repaired in anticipation of the summer traffic.

## *Rochester, N. Y.*

***By Joseph F. Farren***

The Municipal Aviation Field here has had several prominent visitors in recent days. Among them was Irving Glover, assistant postmaster general, who with General O'Ryan of the Colonial Airways was on a tour of inspection of the Colonial's air mail route. Eddie Rickenbacker, war ace, was another notable who dropped in and added his tribute to the efforts made by city officials in building an up-to-date airport. The field, it was made known by Public Works Commissioner Baker, will be fully equipped by June 1. The new hangar

will be ready for occupancy in a very short time.

Beckwith Havens, one of Rochester's veteran fliers and now sales manager of the Loening Aeronautical Engineering Corp., was the latest visitor. He plans another visit May 1, flying the company's latest model cabin amphibian.

Seeing a little miniature airship land in the garden of Anthony Rice in Albion, a village near Rochester, a little girl ran and picked it up. Inside she found a message asking that the finder return it to the Canadian Department of Marine, Meteorological Department, at Toronto, Can. A meteorological instrument was contained inside, the little balloon having made a 62 mi. trip over Lake Ontario, automatically recording air conditions while it flew.

## *Duluth, Minn.*

The Junior Chamber of Commerce committee on aeronautics arranged an interesting display in the Northern Trust Co.'s windows for the purpose of stimulating interest in aviation and educating the people as to the necessity of adequate airport facilities for Duluth. The large map of the airways of the country created wide comment for it showed so conspicuously the absence of any proposed or operating air lines to or from the city and consequently emphasized how far behind Duluth is in comparison to other communities, which is due, of course, to no landing facilities of any nature. The model of the Spirit of St. Louis was an interesting feature of the display and attracted the attention of the passers-by, who then stopped to observe the ideas that were being "put across" through the rest of showings in the window.

Edward E. Spafford, national commander of the American Legion, was the principal speaker at the Fourth Annual Hall of Fame Dinner held in the Hotel Duluth ball room. It has been the custom for three years to have the national commander of the American Legion as the main feature during the yearly banquet of the local post, when the selection by the presidents of leading civic and community clubs of the city's outstanding citizen is announced.

Spafford left McKeesport, Pa., at 4:30 A.M. and arrived at the Arrowhead Airways field in Superior, Wis., at 4:50 P.M. in a Curtiss Falcon piloted by Capt. R. G. Breene, having made a brief stop over on his thousand mile trip at Chicago to refuel the plane.

## *Virginia, Minn.*

C. H. Sigel, the recently appointed Eaglerock dealer in the northern part of Minnesota, has left for Denver to bring back the first plane, which is a long wing OX-5 Eaglerock. Lieut. Lyle Thro, chief pilot of the Minnesota Aircraft Co. of Minneapolis, will fly the plane to the Twin Cities from the headquarters of the Alexander Aircraft Co.

Sigel's Eaglerock will be on display at the Northwest Aircraft Show to be held in St. Paul during the latter part of April, while the Minnesota Aircraft Co. will use its plane for demonstrations to interested prospects.

The site under consideration as the location for an airport will gradually be put in shape for use by fliers sometime in the spring or early summer. Nearly one-half mile of ditches has been dug under the city's direction so as to provide good drainage under all weather conditions.

## *Toledo, O.*

*By D. B. Hoag*

Toledo is scheduled to occupy an important place in the aeronautical field during 1928, according to present plans of local aircraft operators. There will be at least 25 planes operating in Toledo and the vicinity, all engaged in carrying passengers, flight instruction, or some other form of work.

The chief operators are Sky-Way, Inc., which has one new production plane now and two more ordered; George Wells, who has flown in and around the city for several seasons and

**Austin Designs and Builds Aviation Buildings**

AUSTIN designs, constructs and equips efficient hangars, factory buildings and other structures at *low* cost.

Austin guarantees total cost, completion date and quality of materials and workmanship.

Austin will also deliver steel and other essential materials for erection by a local builder at a decided saving in time, worry and expense.

Representative companies from coast to coast have used Austin building service.

*Ask for approximate costs and folder, "Austin Builds for Aviation".*

**THE AUSTIN COMPANY**

*Architects, Engineers and Builders for the Aviation Industry*

CLEVELAND, OHIO

New York Cincinnati Pittsburgh St. Louis Chicago Philadelphia Seattle Portland Detroit The Austin Company of Texas: Dallas The Austin Company of California: Los Angeles and San Francisco

**AVIATION in 30 Easy Lessons**

**STUDY AT HOME BY MAIL**

A complete easily understood course in Aviation fundamentals covering the experiences of famous pilots, mechanicians, shop experts, designers etc., who through years of training, building and flying every type of plane offer you a most practical course—one that will coach you to become a Pilot, Instructor, Designer, Builder etc., or to occupy any position in Aviation. Upon completing the N.A.T. Course, all you need is a few hours instruction in the air.

**Every Branch in Aviation Covered**

including History; Dictionary; Types of Planes; Balloons; Dirigibles; Principles of Flight; Contro and Parts of Ship; Flying Speed; Gliding Principles; Construction; Assembly; Engine Design and Construction; Manufacture and Design of Planes; How to Handle Ship in Air and on Ground; Study of Winds; Air Currents, etc.; Navigation and a hundred other subjects.

**IN LESSON FORM** *not a Book!*

Each subject completely covered in convenient lesson form, systematically and scientifically arranged, including all necessary diagrams, charts, plans etc. Diploma granted upon passing examination.

**Endorsed by Leaders Everywhere**

Pilots, Airplane manufacturers and leaders everywhere in the industry, including hundreds of students, fully endorse our Course proclaiming it one of the most easily understood and fascinating ever written. Learn Aviation the N.A.T. way and you can't make a mistake.

**Save $50 to $100 — Enroll Now**

Write at once for FREE particulars of Course, Employment Service etc., and learn how N.A.T. Students save $50 to $100 when they enroll with us. Act now while special, low tuition fee is in force. Address: Secretary

**NATIONAL AVIATION TRAINING**

Desk AB 510 Detwiler Bldg., Los Angeles, Cal.

**WIN YOUR WINGS**
***at MARSHALL***

**where you learn to**
**Fly by FLYING!**

"Book learning" is essential in some studies — but you can't learn to fly by studying a book. The Marshall Flying School, while imparting to students the fundamentals through expert instructors, takes you right up into the sky in dual control planes with expert fliers. YOU, TOO, ARE A FLIER WHEN YOU FINISH THIS COURSE!

**$400,000.00 Worth of Equipment**

The Nicholas-Beazley Airplane Co.—with several other buildings for housing equipment — a new four-way flying field—a dozen or more new planes always available to students—experts to train you both on the ground and in the air — these are some of the advantages awaiting you at Marshall. Here you will learn the subject thoroughly — from the ground up!

**FREE** Write immediately for your copy of this great book—tells you all about your opportunity at Marshall. Tuition must be increased—come in at once and save $160.00!

**MARSHALL**
**FLYING SCHOOL INC.**
604 North English St., Marshall, Mo.
*Affiliated with*
*Nicholas-Beazley Airplane Co.*



*Write for our new catalog No. AV.2.*

**Helmets and**
**Smart Wearing Apparel**
*for use in open ships* Summer *and* Winter

Special clothing for
CABIN SHIP AND GROUND WEAR

**IHLING BROS. EVERARD CO.**
***Kalamazoo Uniform Co.***
KALAMAZOO, MICH.

**NITRATE DOPE**

**NEW PRODUCTION** **IMMEDIATE SHIPMENT**

***Contractors to U. S. Army and Navy***

**VAN SCHAACK BROS. CHEMICAL WORKS**
**3358 AVONDALE AVE.** **CHICAGO, ILL.**


who will have five planes in use, and the American Air Transport, Inc., headed by Richard Wall, which will have at least three planes operating. One of Wall's airplanes to be flown here will be the Stinson monoplane now making a tour of the country.

E. H. Van Volkenberg, who designed, built and flew the first all metal airplane in the United States, has virtually completed a new type monoplane for Dr. Phelps, retired, who plans on using the plane for his personal pleasure.

Art McDaniel, who operated at Telegraph Road last season, has completed a three place biplane which will be placed in commercial service immediately.

Earl Buchanan, operator of a chain of auto-parking spaces, has one five place plane ready to fly and announces that he will purchase at least one more plane before June 1. Buchanan says he is going to invest $10,000 in aviation this season.

Marty O'Toole, former member of Toledo's police force, will operate two airplanes, one a three place plane and the other a DH4 capable of carrying five or six persons.

## *Cincinnati, O.*

The Public Recreation Commission of Cincinnati, Ohio, will sponsor a Junior Aero Club, according to Will R. Reeves, director of recreation of the commission. Robert E. Coady, supervisor of playgrounds for the body, will have charge of organization of the classes, and Charles A. Hinsch, chairman of the Aviation Committee of the local Chamber of Commerce, will furnish the supplies needed for the construction of model planes by the club members. The club will be limited in the beginning to 30 boys less than 16 years old, and will meet weekly in one of the city's public schools. Besides the model-making, the boys will hear addresses from time to time on the latest planes and their flights.

Under the direction of Lieut. Stanley C. Huffman of the Embry-Riddle Co., operator of Lunken Airport, Cincinnati, the initial shipment of air express left the field on April 2, and arrived in Chicago on schedule time. This service was inaugurated following arrangements between the American Railway Express Co. and the Embry-Riddle Co., which latter firm also has the contract for transportation of air mail between the cities named. The first shipment from the Queen City, according to officials of the company, was greater than that made on the first Chicago-New York express plane. Shipments for points beyond Chicago are transferred to other planes.

## *Worcester, Mass.*

***By Henry T. Ford***

Two air mail boxes have been placed in prominent positions in this city by Postmaster James F. Healy in an effort to develop business for the New York-Boston line.

At present the air mail is sent to the East Boston airport but Postmaster Healy believes that the amount of business which will develop will make a stop at Whittall Field here necessary. The Colonial Air Transportation Co., operating the air mail between New York and Boston has assured the Worcester postmaster that the stop will be made as soon as the business demands.

Adm. Ralph Earle, president of Worcester Polytechnic Institute, has been elected president of the Worcester Airport, Inc., to succeed George N. Johnson, first president of the organization. John Lasell of Whitinsville has been elected vice president and James Whitin a director. Mr. Lasell, M. Whitin Whittall, and James P. Whittall have been chosen as a board of managers of the airport.

Heustis Wells, who has been piloting on the Key West to Havana line since January, was a recent visitor to this city. He has accepted a position with the Fokker company as a test pilot and assistant to the engineer. Wells was one of

Worcester's first aviators. His suggestion that a beacon be placed in this city as a signal that an airport is nearby may be acted upon in the near future.

## Cottage Grove, Ore.

Though only a few feet of space was available, the Cottage Grove Aero Club recently set up a display at the annual exhibit held in the city, packing those few feet with as many aeronautical pieces as possible. The display, it developed, was a highly profitable one; for an airport with at least three planes have been promised.

Decision to enter the exhibit came shortly before the show. One of the club members sent to the Pacific Air Transport

*Only a little space was available and time was short, but Cottage Grove Aero Club members arranged this display in double quick time, and an airport is promised as a result of the attention attracted.*

Co. for some air mail literature; and since there was little time to spare, one of the P.A.T. mail planes dropped the packet at Cottage Grove as it passed on its regular trip. A great deal of attention was attracted by this stunt, and business men, seeing the value of such quick service and the necessity of having an airport, soon gathered in conference and decided on the building of a municipal field.

## Little Rock, Ark.

*By Joe Harry Weston*

A crowd of over 10,000 is estimated to have seen the tri-engine Ford monoplane of the Texas Company, piloted by Capt. Frank B. Hawks, on the first day of its three day visit at Little Rock. The plane landed at the government airport here. It was roped off, and the crowds were handled by uniformed members of the 154th Observation Squadron, Arkansas National Guard. Governor Parnell of Arkansas, the mayor of Little Rock, chamber of commerce officials, and newspaper men were given rides in the plane during its stay here. A side trip was made to Pine Bluff later. On this trip, Maj. J. Carroll Cone, commanding officer of the 154th Observation Squadron, was in the pilot's seat with Captain Hawks as relief pilot. The plane left later for its next stop, Memphis.

## Salt Lake City, Utah

*By Robert Blackstone*

Value of Salt Lake City as an aviation center was recently pointed out here by Clarence M. Young, assistant secretary of the Department of Commerce in charge of aviation, on


# Protect

## *your aviation investment —*

ADEQUATE insurance at reasonable rates is one of the vital factors in profitable commercial flying.

WE have built up an aviation insurance business through knowledge based upon flying experience and service to manufacturers, operators and pilots.

*Our Policies are Written to Cover Your Individual Needs*

Fire and Transportation, Public Liability, Property Damage, Personal Accident, Employer's Liability, Accidental Damage, Loss by Theft, Passenger Liability, Windstorm Damage and Workmen's Compensation.

*Let us know your Problems.*
*Our Consultation Service is Free.*

JAMES E. MALLETTE & SON
TORRINGTON, CONNECTICUT

# OX5 Cylinders

Have your worn cylinders reground and oversize pistons furnished.

*Write for prices.*

Engine and Machine Part Manufacturing a Specialty.

**Edward A. Whaley & Co.**
**Norfolk, Va.**

**MODERN MILITARY AND COMMERCIAL PLANES**
***Are Equipped With Our***
**SHOCK ABSORBER CORD**

**Pioneers in the Manufacture of Elastic Cord for Shock Absorbers in this Country.**

**Principle Producers of Cord for Canadian and U. S. Governments during the World War.**

**Fully Equipped for the Largest Requirements or Any Experimental Tests.**

**J. W. WOOD ELASTIC WEB CO.**
**STOUGHTON, MASS., U.S.A.**
**New York Office—45 E. 17th St.; Canada—32 St. Peter St., Montreal**

# AUSTRALIA

*We are prepared to negotiate for the following:—*

The Australian manufacturing rights (royalty basis) of aircraft and sole agencies of aircraft material, stores and aerodrome equipment.

## *We Are Contractors To :-*

**Royal Australian Air Force.**
(Reconditioning aircraft, manufacture of spare parts and supply of stores).

**Civil Aviation Department.**
(Manufacture of Spare Parts).

**Australian Aerial Services.**
(Manufacture of airscrews, reconditioning aircraft and engines, supply of stores, petrol and oil storage plants etc.).

**Works & Railways Department.**
(Installation of aerodrome bulk petrol storage plants).

*Address complete specifications, price lists and draft agreements to:—*

LARKIN AIRCRAFT SUPPLY Lasco CO. LTD.

Melbourne Airdrome, off Dudley Street

# SEAMLESS STEEL TUBING

*All Aircraft Grades*

WAREHOUSE STOCKS for immediate shipment in any quantity.

MILL shipments for substantial production requirements.

SERVICE STEEL COMPANY
1435 Franklin St. DETROIT
43 John St. CINCINNATI

# TITANINE
Registered Trade Mark

***A Complete Range of***
**AIRPLANE FINISHING MATERIALS**

Dope-proof paint, black, white, aluminun or grey;
Clear nitrate and acetate dopes;
Ti-two colored one-material dope;
Pigmented nitrate dopes;
Flexible wing lacquer;
Wood and metal lacquer (for inside and outside finish).

**TITANINE, Inc.**
***Union, Union County, New Jersey***
Contractors to the United States Government


his arrival in a Boeing Transport plane from San Francisco. Mr. Young has just returned from Honolulu, where the Department is preparing to give attention to aviation in the Islands.

Authority has been granted to Harry L. Finch, commissioner of parks, and H. C. Jessen, city engineer, to make an estimate on needed airport improvements here.

## *Moundsville, W. Va.*

Langin Field at this city, formerly used by the Government as the principal midway point on the model airway between Dayton, O., and Washington, D. C., has been kept in good shape for the use of pilots in the vicinity and for visiting planes. Transient planes are accommodated at the steel hangar on the field where gasoline, oil, and mechanic service is available.

Visiting pilots are informed that the field may be located by its proximity to the river. The hangar is painted red with large white letters on the roof reading "Langin Field". Prevailing winds are north and south, and a sock has been provided for definite wind direction determination.

Langin Field is nearly midway, as stated before, between Washington and Dayton thus making an ideal stop for airmen traveling between the two cities. The airline distances given are 185 mi. to Dayton and 215 mi. to Washington.

H. C. Compton of the Central Chevrolet Co. at Moundsville is owner and manager of the field.

## *Chehalis, Wash.*

The Chehalis Municipal Airport, located one mile from the center of the city, is open to visiting airmen, it is announced. The field is 1,300 ft. square, and an option is held by the city on an additional 50 acres to the north which may be used if needed. There are three runways of good length.

Both the city and field are well marked, there being "Chehalis" on the roof of the Ford Building and two arrows on the Auditorium, one pointing to the airport and the other due north and south. The field is also marked with the regulation white circle, and "Chehalis" will be painted on the roof of the new hangar now under construction.

The St. John Air Service, Waco and Ryan Brougham dealer, operates the airport on a percentage basis for the city, the mayor, chamber of commerce, and city commission backing the project.

A Ryan Brougham is now in use at the field for business and pleasure flights. A school, furthermore, will soon be conducted with instruction in new Waco planes. Vernon Bookwalter, formerly with the Pacific Air Transport Co., is in charge of the field.

## *Seattle, Wash.*

*By M. Canel*

The Board of County Commissioners at Seattle has tentatively granted permission to two Seattle concerns, the Seattle Airways, Inc., and the Phillips-Froberg Flying School, to construct permanent hangars on the Municipal Flying Field at Georgetown. Definite granting to these two organizations of the right to proceed with the work is being postponed until the prosecuting attorney's office, the county engineer, and the aviation committee of the Chamber of Commerce have an opportunity to submit plans and recommendations to the Board.

## *Bristow, Okla.*

*By Ernest W. Fair*

The Bristow chapter of the National Aeronautic Association has been organized here with 25 members. C. L. Freeland, owner of Bristow's new airport, was elected president; R. L. Jones, oil man, was elected vice president. Sanford Brown was named treasurer, and W. S. Symonds, secretary. M. H. Kotzebue, governor of the Oklahoma district of the

association, was the official representative at the meeting. Plans for a ground school for instruction of local aviation enthusiasts in the various phases of aviation are now being made. The dedication of the new airport has been set for May 25.

A school of aeronautics was begun April 2, and is to be continued in weekly classes until the dedication of the airport. Illustrated lectures on airplane parts will be given as well as other various phases of aviation.

Miss Francile Abraham, Bristow heiress, is the latest Oklahoma girl to go into the air. She is now taking flying lessons at the airport at Tulsa and has ordered a plane for personal use. Speed cops, she said, got bothersome.

## *Duncan, Okla.*

The new municipal air field here was given its first recognition of any importance when Erle P. Halliburton, inventor, and owner of the Halliburton Oil Well Cementing Co., landed at the airport with his new Lockheed monoplane, the first Duncan-owned plane.

The plane, named the "Spirit of Progress", was greeted by company officials and several hundred citizens of Duncan upon its arrival. A noteworthy thing about Halliburton and this plane is that it had but 2 hr. 10 min. in the air when he and his pilot flew it away from the factory at Los Angeles. The plane is painted orange. It is to be used for business purposes in the oil fields.

## *Richmond, Va.*

A flying club has now been formed at the University of Richmond at this city through the efforts of J. Day Lee, Jr., R. R. Patterson, and L. S. Cooper. The club plans to raise money for a plane to be used at one of the local flying fields which has been made available for the organization, and instruction to members will be given by local pilots.

Lee attended the meeting of the college flying clubs in New York City in which plans for the Grover C. Loening college flying club competition were discussed. With the help of the alumni and friends of the University of Richmond, Lee feels that the club will soon have a plane and that one of the members, some of whom have had flying experience, will be able to represent the organization in the college competition, which will be held at Mitchel Field, L. I., N. Y., in June.

The Richmond College Flying Club has named an honorary committee consisting of V. S. Lawrence, Jr., faculty adviser, S. P. Ryland, treasurer of the club, Colonel McAdams, E. B. Snydor, president of the local chamber of commerce, Mayor F. Fulmer Bright, Gov. Harry F. Byrd, and Comdr. Richard E. Byrd.

## *Atlanta, Ga.*

*By John K. Outley, Jr.*

Mr. and Mrs. Clarence Chamberlin were the guests of the Atlanta Chapter of the National Aeronautic Association at a dinner given in the Biltmore Hotel on the occasion of the New York to Germany flier's recent visit to Atlanta on his tour of the Southeast.

Chamberlin is flying a Sperry biplane with a wing span of 26 ft. The plane is too small for use except by more experienced pilots, and a slightly larger plane is being designed with an idea of mass production, according to Chamberlin.

The Chamberlins spent several days in Atlanta and took advantage of the opportunity to visit Stone Mountain.

## *Lancaster, Pa.*

*By Rupert E. Herr*

Lancaster Airways, Inc., has received its charter from the Pennsylvania Public Service Commission. The officers of the company are Maj. W. D. Grant (U.S.A.C. Res.), president; A. D. Howry, secretary; E. L. Esbenshade, treasurer;


CURTISS-REED PROPELLERS

National Air Transport, operating the Air Mail and Express lines from New York to Chicago and Chicago to Dallas, write us:

"Of the 11 Curtiss-Reed propellers which we now have, one has seen 1,000 hours' service, one over 900 hours, one over 800 hours, two over 700 hours, and the remainder between 300 and 500 hours.

"We feel sure that all of them are good for 1500 hours unless some difficulty should develop which we do not anticipate now."

Two Types now available

*Type R.*—A solid forging of high efficiency and strength. Particularly desirable for motors of 200 H. P. or more.

*Type D.*—A flat, twisted type, for lower-powered motors. The most inexpensive metal propeller on the market today, despite its efficiency and long life.

*Write for Prices*

The Curtiss Aeroplane & Motor Co., Inc.

*Offices:* Garden City, N. Y.
*Factories:* Garden City & Buffalo, N. Y.

Curtiss

PERRY-AUSTEN
Acetate Nitrate DOPES Clear Pigmented
PERRY-AUSTEN CLEAR ACETATE DOPE
*The Lasting Undercoat*
The Best Finish { Undercoats—Our Clear Acetate / Uppercoats—Our Pigmented Dopes
Perry-Austen Mfg. Co., Staten Island, N. Y.
*Contractors to United States Government*

LINDBERGH FIELD "America's Finest Airport"
Is Now Under Construction In
San Diego California
"THE AIR CAPITAL OF THE WEST"
Attractive factory sites, San Diego's *unequalled* climate for year 'round flying, testing and manufacturing, plenty of skilled labor at reasonable wages, the support of this progressive "air conscious" city, and many other advantages are offered to aircraft industries in San Diego. *Inquiries solicited.*
Write to INDUSTRIAL DEPARTMENT
Chamber of Commerce
790 Chamber of Commerce Bldg., San Diego, California

**William. E. Arthur & Co., Inc.**

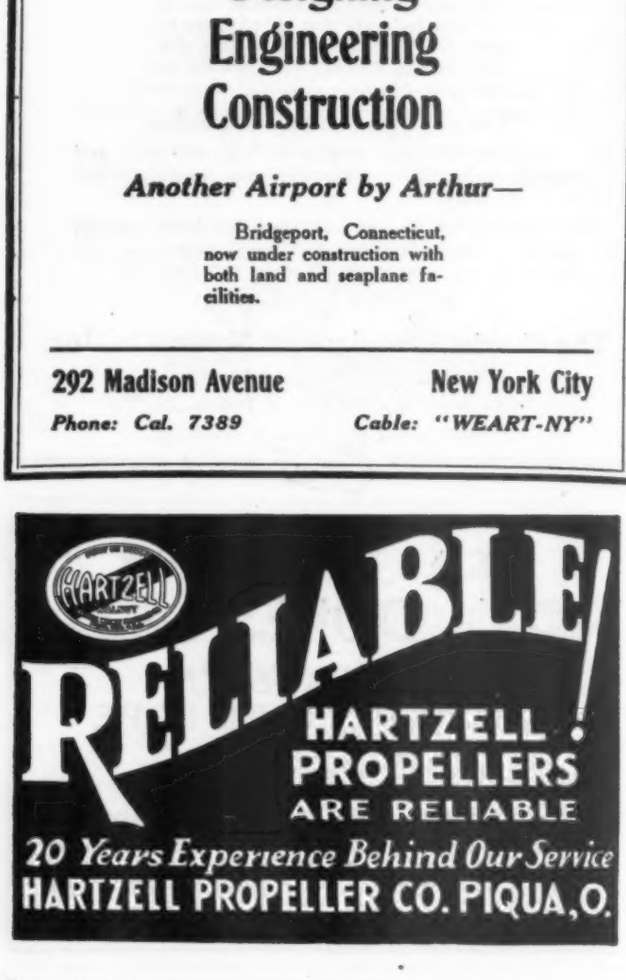
***Aeronautical Engineers & Builders of Airports***

**Consulting**
**Designing**
**Engineering**
**Construction**

***Another Airport by Arthur—***

Bridgeport, Connecticut, now under construction with both land and seaplane facilities.

**292 Madison Avenue** **New York City**
***Phone: Cal. 7389*** ***Cable: "WEART-NY"***




***Keeping Abreast***
of aeronautical activities is possible only by reading
AVIATION
each week. Yearly subscription rates: United States $4; Canada $5; Foreign $6.
AVIATION
250 W 57TH ST. NEW YORK CITY

A. R. Jacobs and J. P. Jones, directors. J. P. Jones has been appointed operations manager of the airport.

Four planes will be used, a Pitcairn Orowing for training, a new Waco 10, which "Al" Jacobs flew up from Philadelphia recently, a Waco 9, and a Fairchild cabin monoplane.

Lancaster Airways, Inc., are authorized dealers for Waco and Fairchild planes in this territory. Several local enthusiasts expect to purchase planes this summer and are now under instruction.

The company has been conducting extensive parachute test work for Follmer Clogg & Co. under the direction of S. H. Knigth.

Capt. Frank Hawks is expected to visit here early in June in a Ford tri-engined transport under the auspices of the Texas Oil Co.

Visiting pilots are advised by the operations manager to use the northern portion of the Lancaster field while the southern part is under construction.

## *Gettysburg, Penna.*

After making his first solo flight at the Gettysburg Airport as a member of the flying school being conducted by the Gettysburg Flying Service, Inc., A. R. Pottorff of Waynesboro announced he has acquired a field in his city and a plane. He plans to enter commercial aviation shortly.

Blaine Walter of Gettysburg was the first to solo in this community, his instruction also being taken at the Gettysburg Airport. Walter is a former inspector of state police now engaged in the automobile business.

## *Provo, Utah*

Provano Beach, on the shore of Utah Lake and straight west of Provo on Center St., where the city owns a large tract of land, was inspected recently by members of the city commission, the local chamber of commerce, and the city engineering department as a suitable location for an airport.

Each member of the party was favorably impressed with the site, and the local engineering department will plot the runways and make other investigations as to the feasibility of using this beach for a flying field.

C. H. Stebbins of the Red Raven Aero Club of Salt Lake was also a member of the party and was highly pleased with the proposed landing field. He declared that when the club was assured of a local airport that it would build an all-metal hangar and maintain one plane for emergency purposes. During the summer months Mr. Stebbins said the club would establish a scenic line to Zion Canyon.

## *Madison, Wis.*

*By H. C. Brunner*

The Royal Airways, Inc., has added another plane to its flying school. The new plane is a Waco instruction plane which is fitted with dual controls, twin instrument boards, and a special landing gear. The company now has three airplanes, two expert pilots, and a field manager, and will soon announce a third pilot. At present 50 students are taking lessons in flying under Howard A. Morey, chief pilot of the company.

The Kempton-Dudley Flying Service Corp., formed by Willett Main Kempton, Delos Dudley, and Eldon Johnson, all of Madison, has acquired an 80 acre tract of land between Janesville and Beloit, Wis., and will open an airport there. According to Mr. Kempton it was decided to secure a site that would serve both Janesville and Beloit since air mail officials had indicated that stops could not be made at both cities. For the present the concern will offer passenger and instruction service and cross-country trips. Eldon Johnson will be chief pilot of the company, which will have two planes at the airport at all times and three at intervals, and Mr. Dudley will be chief mechanic and reserve pilot.

## *Wausau, Wis.*

*By Wells E. Turner*

Flying activities at the Alexander Airport continue in first class style. The field is now in excellent condition, having thoroughly dried out during the recent warm period.

The Iron Products Corp. of La Crosse, Wis., has taken delivery on a Waco 10 OX-5 plane. The Northern Airways, Waco dealer here, also reports the sale of a Wright Whirlwind powered Waco 10 to Roy Larson, Larson, Wis.

Plans are now being formulated for the complete lighting of the Alexander Airport; several airport lighting companies have drawn estimates on the work.

It is expected that with the new lighting equipment and restaurant facilities, the Alexander Airport will receive a triple A rating by the Department of Commerce.

## *Marshall, Mo.*

Duke Thompson soloed at the Marshall Flying School recently, then flew to Buffalo, N. Y., and to New York City, Benny Howard of Denver, former instructor at the Marshall School, accompanying him on the trip. The flight from Marshall to Buffalo was made in an Eaglerock plane in 10½ hr.

The Marshall school now has an enrollment of around 100 students, seven pilot instructors teaching the group. New hangars and floodlights are planned for the Marshall field, it has been announced.

## *Bucklin, Mo.*

The first northern Missouri air field, established by A. D. Carther, a licensed pilot, was recently formally dedicated here. Mr. Carther is proprieter of the field of 60 acres and established the port with no financial assistance beyond that extended him by a small group of interested friends. He recently bought an Eaglerock plane at Kansas City and flew it into the home port, a distance of 157 mi. in 80 min.

## *Orlando, Fla.*

*By R. T. Bly*

Pilots calling here will now note the new airport sign painted on the roof of the Florida Press, Inc., located near the city's center. The 10 ft. white block letters have been placed on a black background and an arrow is included pointed in a North Northwest direction to Buck Field two miles distant where hangar accommodations, machine shop, supplies, etc., will be found. The field is a commercial one, but all visiting pilots are welcome to use it.

## *Ann Arbor, Mich.*

The Ann Arbor Flying Club recently named Frank Devine, chairman of the airport committee of the local chamber of commerce, as president. Hackley Butler and Paul Wagner will act as vice presidents, while O. O. McLeish will be secretary and Alfred Staeb, treasurer.

The flying club sponsored a special trip to the Detroit All-American Aircraft Show held last week in Convention Hall.

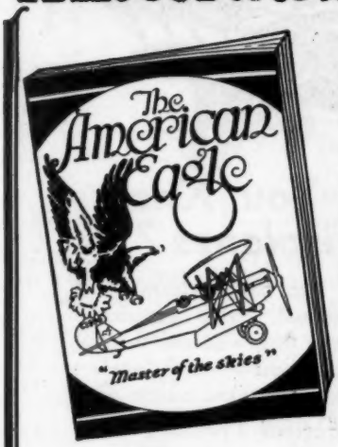
## *Sioux Falls, S. D.*

F. W. Koneman, president of the Airport Holding Co., and Rush Brown, one of the leaders in the project, with R. E. Gragstad, Sious Falls city engineer, have completed survey of a site where an airport will be established here. The port will be a Class A field in matter of area and improvement work will start at once.

## *Des Moines, Ia.*

The Iowa general assembly in a recent special session defeated the effort of Senator Baird of Pottawattamie County to exempt lands for use as airports from taxation. The house defeated the bill after it had gone to that body for concurrence.


**A Record to be Proud of**




**There has never been a structural failure with an *American Eagle***

**The *American Eagle* has never been defeated in any performance contest.**

**Send for this new booklet, it fully illustrates and describes this most wonderful performing, beautiful**

***"Master of the Skies"***

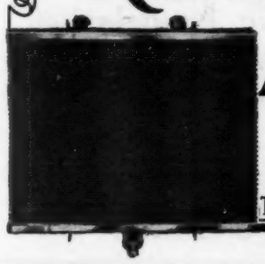
**We want you to own an *American Eagle* because we know you will be as proud of its amazing performance, maneuverability and beauty as we are in the privilege of building it.**

***With OX5 Motor, Hartzell Propeller, Burnished Aluminum Cowling — — $2885, Kansas City***

*American Eagle Aircraft Corporation*

2806 East 13th Street
Kansas City, Missouri

**G&O *Radiators* for AIRCRAFT**



**EFFICIENT**
**LIGHT WEIGHT**
**DEPENDABLE**

The G&O Mfg. Co., New Haven, Conn.

*Type F, Star Pathfinder Compass*

**The newest type of Aircraft Compass**

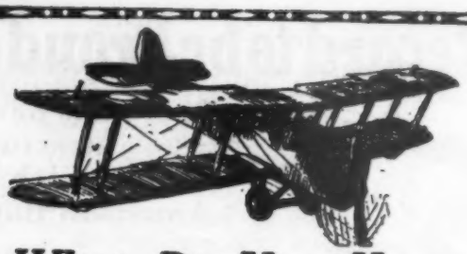
*(flush mounting)*

**Type F, Star Pathfinder Compass has a built-in compensating unit, eliminating use of troublesome loose magnets. Mounts flush with instrument board surface and compensating unit is easily accessible by means of a removable cover plate. Spherical magnifying cover lens gives great visibility.**

**CONSOLIDATED** Instrument Company of America, Inc.

41 East 42nd Street, New York

***Altimeters, tachometers, oil pressure gauges, gasoline gauges, thermometers, air speed indicators, compasses, navigation lights, landing lights, dash lights, etc.***



**What Do You Know About Airplanes?**

A FEW years ago men had to learn about aircraft from personal, costly experience. They had no one to guide them—no one to point out mistakes when they were made—and therefore years were spent learning what takes months now.

***Thorough--Practical Training***

Today the American School of Aviation offers you these long years of experience and knowledge, which cost millions to acquire, in their new and fascinating Home Study Course in Practical Aeronautics which has been highly endorsed by prominent aviation authorities.

***Write Today***

No matter whether you have worked with airplanes all your life or are just beginning in the industry you owe it to yourself to send for a complete and detailed outline of this training and our new and interesting free book, "Opportunities in the Airplane Industry."

***American School of Aviation***

*Dept. 8274*

**3601 Michigan Ave., CHICAGO, ILL.**

**TO MAKE AMERICA FIRST IN THE AIR**

**IS THE PURPOSE OF THE**

**National Aeronautic Association**

***In this effort it merits and invites YOUR cooperation and support***

**Regular Membership $5.00 per Year**

**NATIONAL HEADQUARTERS**
**The Barr Building, 910 17th St., N.W.**
**Washington, D. C.**

HAVE seats for sale in Stinson Monoplane entered in 1928 National Air Tour. An eight thousand mile trip taking one month's time. Price $1000.00 per seat. Paul Braniff, Braniff Building, Okla. City, Okla.


# UNITED STATES AIR FORCES

## *Benefits Asked for Veteran Army Airmen*

Preferential benefits in compensations and retirement annuities for pioneer aviators of the Army in recognition of their services is urged in the McSwain Pioneer Aviator's Bill now before Congress. There are only seven of the veteran airmen now on active duty, these being Brig. Gen. Frank P. Lahm, Brig. Gen. Benjamin D. Foulois, Lieut. Col. Roy C. Kirtland, Maj. Henry H. Arnold, Maj. Thomas DeW. Milling, Maj. Lewis H. Brereton, and Maj. Herbert A. Dargue.

The bill, introduced by Representative McSwain of South Carolina, calls for an amendment of the National Defense Act to give the officers of the Air Corps who qualified as pilots on or before Dec. 31, 1913, a 75 per cent. increase in pay in place of the 50 per cent. increase for flying duty provided for in the act. The retired pay of such pioneer officers, of whom there are but 14 now living of the original 35, would be 75 per cent. of all the pay and allowances of the grade held at retirement, including flying pay.

## *Army Air Orders*

Lieut. Leland D. Webb, VF Squadron 5B Battle Fleet to *U.S.S. Lexington*.

Lieut. John D. Alvis, Aircraft Squadrons, Battle Fleet, to Naval Air Station, Pearl Harbor, T. H.

Lieut. Dewey G. Porter, VO Squadron 2B (*Colorado*) to Naval Air Station, Coco Solo.

Lieut. Comdr. Gerald F. Bogan, Command VF Squadron 1B to Naval Air Station, Pensacola.

Lieut. James V. Carney, VF Squadron 1B to Naval Air Station, Pensacola.

Lieut. Joseph J. Clark, VO Squadron 2B (*Pennsylvania*) to Naval Air Station, Anacostia.

Lieut. John G. Farrell, Naval Air Station, Pensacola, to VO Squadron 2B.

Lieut. James D. Lowry, Jr., Naval Air Station, Pensacola, to VO Squadron 3S (*Raleigh*).

Lieut. Adrian O. Rule, Jr., Naval Air Station, Pensacola, to VT Squadron 1B.

Lieut. (jg.) Clarke H. Lewis, VF Squadron 1B (*Langley*) to Naval Air Station, Pensacola.

Lieut. (jg.) Henry F. MacComsey, VF Squadron 6B to Naval Air Station, Pensacola.

Lieut. (jg.) Herbert E. Regan, VF Squadron 6B to Naval Air Station, Pensacola.

## *Plan Army and Navy Aircraft Maneuvers*

By direction of Dwight F. Davis, secretary of war, the commanding generals in Panama, Hawaii, the Philippines, and the First, Second, Third, Fourth, and Ninth Corps Areas have been instructed to arrange with commandants of corresponding naval Districts for combined exercises this year between Army and Navy aircraft. This action is in conformity with the recent approval of the recommendations of the Joint Board whereby through such exercises there will be developed basic methods to govern combined air action of the two services.

## *Wasp Engine Donated to N. G. Squadron*

The 118th Observation Squadron, C. N. G., at New Haven, Conn., was recently presented with the Wasp engine in the new DX-12 experimental observation plane being used by that squadron. The engine is the gift of the Pratt & Whitney Aircraft Co. of Hartford, Conn., presentation being made by Frederick D. Rentschler, president of the company, to Maj. William F. Ladd, commanding the squadron at Brainard Field. Governor Trumbull of Connecticut was one of the witnesses.

## *Bill Asks Credit for Airship Duty*

Naval officers will be permitted to count duty on airships as sea duty and therefore credit toward promotion if a bill which would amend the revised statutes in this way is passed. The House Committee on Naval Affairs recently reported favorably on the bill.

# WHERE TO FLY

*California*

## *Learn Aviation at the University of the Air*

***The First Adequately Equipped Aviation School in America***

Twenty per cent of the aviation activities of the United States are located in Southern California. Our students are in touch with this immense field.

**Day School-Night School-Home Study**
*Send for new catalogue and complete information.*

**Warren School *of* Aeronautics**
**130-26 W. Slauson Ave., Los Angeles, Cal.**

*California*

**The Western College of Aeronautics**
**Announces**

**Mr. Wm. J. Waterhouse,**

**Internationally famous aeronautical engineer. Dean of the W. C. of A. Faculty.**
The Western College of Aeronautics is not merely an aviation school but is a true University of the Air, one of the most adequately equipped aviation training institutions in the entire West.

**Our courses on every phase of ground and air schooling are not excelled.**

**Investigate this statement and be convinced.**

**Full information mailed on request.**

**Western College of Aeronautics**
154 West Slauson Avenue
LOS ANGELES, CALIFORNIA

*California*

LEARN TO FLY IN
**San Diego**—Air Capital of the West

**RYAN *Flying* SCHOOL**

Perfect Year Round Flying Climate · Modern Equipment · Complete, Thorough Course · Specially Trained Instructors · Small Classes Individual Instruction · Close to Largest Army, Navy and Marine Base in West · Write for Catalog.

**RYAN**

RYAN FLYING SCHOOL
San Diego, California

*California*

**PACIFIC TECHNICAL UNIVERSITY**

**SAN DIEGO CALIFORNIA**

*"Air Capital of the West"*

**Offers home study courses in Aeronautical Engineering and Practical Aviation.**

**Residence Courses in well equipped shops, with class room instruction.**

**Affiliated with Ryan Flying School, where our students can actually learn the art of flying with new airplanes equipped with the famous Ryan-Siemens Engines.**

WRITE FOR CATALOG

*Connecticut*

**NEW ENGLAND AIRCRAFT CO., INC.**
DISTRIBUTORS FOR

WACO AIRPLANES

**The FAIRCHILD CABIN MONOPLANE**

**Flying instruction year round on new Waco 10s. Commercial flying, Advertising, Photography, Aerial exhibitions, Parachute drops, supplies and service. Operating largest school of commercial flying instruction in New England. We operate from Brainard Field, grade A certified airport.**

*Executive Offices*
**805 MAIN ST., HARTFORD, CONN.**
**Phone Office 2-2553 Phone Field 3-1423**
**WORCESTER BRANCH FLYING SERVICE**
**North Grafton, Mass. Phone Park 6845.**

*Illinois*

**Aviation Service & Transport, Inc.**
**Will train a few additional men intensively or spare time or home study for good pay positions in flying or ground mechanics. Best central shop and field location. Only U. S. licensed latest planes, pilots and instructors. Write Dept. A. W., Aviation Service & Transport, Inc., 205 N. Wabash Ave., Chicago.**

*Illinois*

**CHICAGO AERO SALES**
**FLYING FIELD**
**Sales—"WACO AIRPLANES"—Service**
**Student training in *new Waco* 10 airplanes**
***Rates and full particulars on application***
**Office—8027 Ogden Ave., Lyons, Ill.**
**Phone, Lyons 7121.**
**Flying Field—Joliet Rd. and East Ave., La Grange, Ill.**

*Illinois*

***Only 50 miles west of Chicago***
**EAGLE AIRPORT SCHOOL OF AVIATION**
**Herman J. Neubauer, M.D.**
HINCKLEY, ILLINOIS
**Learn to Fly at our up-to-date school at very reasonable prices. Complete ground and air course. Come any time. Ideal accommodations for students. Expert instructors. Write for information.**

*Illinois*

**MIDWEST AIRWAYS CORPORATION**
**Monmouth, Illinois**

**Waco airplane distributors in Illinois and Iowa. Complete flying and ground course, using new planes.**

*Illinois*

**Quincy Aircraft Company**
**QUINCY, ILLINOIS**

Complete flying and ground course. Licensed Waco planes. Transport licensed instructors. Large field. Write for information.

INCREASE YOUR
ENROLLMENT OF STUDENTS
BY ADVERTISING WEEKLY
in the
*WHERE TO FLY SECTION*

*Indiana*

**We Teach You — *RIGHT.***
— THREE —
*Complete Practical Courses*

*INVESTIGATE US—WE WANT YOU TO*

We have the finest equipt school shop in the country—Swallows for instructions.

We qualify you for Dept. of Com. licenses.

Mechanics Course 50.00
Private Pilots Course 250.00
Limited Commercial 50 Hr. Course 650.00

*No Bond for Solo—We're Not Afraid of Our Graduates. Send for Descriptive Literature and Free Booklet.*

**ATKINSON AVIATION CO.**
*"SCHOOL OF AERONAUTICS"*
406 WASH. ST. GARY, IND.
*REFERENCES PLENTY*

*Indiana*

**Learn to fly at the Cross Roads of the Nation with instructors who have had 12 years experience teaching men to fly.**

**HOOSIER AIRPORT**
**Indianapolis, Indiana**
**Distributors for TRAVEL AIR Planes in Illinois, Indiana, Kentucky, West Virginia.**
***We taught the Army.***

*Iowa*

**Commercial Air, Inc., Battle Creek**

**Expert instruction in flying, mechanics, meteorology, etc. Department of Commerce gives examinations and flying tests at our field. If unable to start actual flying at once we have a special preparatory correspondence course only $25.00.**

*Iowa*

***LEARN TO FLY ON NEW 1928 WACO PLANES***

**COMPLETE FLYING AND GROUND COURSE $125.00. Send for Catalog.**

***Distributors for Waco Airplanes***

**DAVENPORT AIRPORT INC.**
**DAVENPORT, IOWA**

*Kansas*

**Learn to Fly the Great Western Way. We teach Navigation, Meteorology, Airplane Assembly, and Rigging. Our students all solo and our course includes cross country training, formation flying, emergency landings. Flying instruction, $125.00. Airplane mechanics course of instruction, $100.00. *Write for full information.* Great Western School of Aviation, Box 138, Kansas City, Kansas.**

*Kentucky*

**Iseman Flying Field, Paducah, Ky. Learn to fly for $10.00 per lesson. No down payment. We guarantee complete instructions not to exceed $200.00. Course includes cross-country, aerobatics, meteorology, rigging, motor mechanics. No bond required for solo. Planes rented reasonable after solo. *Taxi and express service 35c per mile.* We use new Eaglerock and Travel Air planes.**

*Louisiana*

**Complete flying and ground instruction. $20 per hour. Pay as you learn. Write for details of course. Year around flying weather. Louisiana distributors of WACO airplanes.**

**SOUTHERN DUSTING CO., INC.**
**Tallulah, Louisiana**
***(Where Airplane Dusting Was Developed)***

# WHERE TO FLY

*Massachusetts*

**BOSTON AIRPORT CORPORATION**
East Boston, Mass.
*Divisions*
Boston Airport Flying School, Boston Aerial Sightseeing Service, Boston & New England Air Taxi Service, Boston, Marthas Vineyard & Nantucket Airways.
STINSON DETROITER TRAVELAIR
Tel. East Boston 0362 *1673*

*Massachusetts*

**Dennison Aircraft Corporation**
10 Hour Air Instruction and 30 Hour Ground School — $250.00. Air instruction on modern steel tube ships. Ground instruction includes, Engines, Structure, Navigation, Aerodynamics, Meteorology. *Agents for* FAIRCHILD and WACO planes.
Address:—
Dennison Airport, Atlantic, Mass.

*Massachusetts*

## *Old Colony Airways Corporation*

**Muller Field - Revere, Mass.**
P.O. Box 285.
*Eastern Mass. Dealers*
**Eaglerock and Ryan Brougham Planes**

Student instruction under supervision of transport pilots in new Eaglerocks recognized as one of America's best training ships. Some choice dealer territory still open.

*Minnesota*

**ROTH - DOWNS AIRWAYS, INC.** *Travel-Air Distributors.* Complete flying and ground instructions. Learn to fly with a $150,000.00 corporation in new Travel-Air planes. Our instructors are licensed transport pilots, wth many years experience. Resident and correspondence courses. *Write for Information.* 2510 University Ave., Phone Dale 3079, St. Paul.

*Missouri*

**ST. LOUIS AIRCRAFT COMPANY**
Lambert St. Louis Flying Field
ANGLUM, MO.
**Distributors American Eagle Airplanes**
*Flying instruction the year round.* Primary flying course of 10 hours. Advanced flying course of 15 hours. Courses include all ground work and practical instruction in our shop. *Write for further particulars.*

*Missouri*

## An Amazing Story of YOU in Aviation!

Read this wonderful book! Hundreds of others have shot up to fame and fortune in the world's most promising field — Aviation. Learn what you can do in a few short months. Be a flyer—not a piedder. LEARN TO FLY and learn Air Navigation, Meteorology, Aerodynamics, Airplane Construction and Maintenance, Motor Overhaul, Airport Management. Newest equipment used in any school. Travel Air, Waco, Eaglerock—Whirlwinds, Siemens, etc. A postcard with your name brings "Skyward Ho!" the full story of our training and your success, immediately—free! Write at once.

PARKS AIR COLLEGE
AFFILIATED WITH

294 Mo. Theatre Bldg. St. Louis Mo.

*Missouri*

## Qualify for Private Pilot's License

15 hours flying or limited commercial license with 50 hours flying. Take examinations in training ship on training field. Officer stationed here. Richards Field oldest and best flying port. We train in newest and safest Eaglerock commercial planes. Licensed transport pilots (highest rating) instruct you. Thorough mechanical training. Send name for full details and personal complimentary pass entitling you to trip in Eaglerock airplane free.

**Bennett Eaglerock Flying School**
**225 West 12th Street, Kansas City, Mo.**

*Missouri*

*"The School of Superior Training"*
**KANSAS CITY FLYING SCHOOL INC.**
*—Master Instructors—New 1928 Ships—*
10 HOUR COURSE $200—15 HOUR COURSE $275—50 HOUR COURSE $600
You pay only for the time actually in the air. Ground course and instruction is absolutely free to our flying students. This includes meteorology, navigation, motors, construction, rigging, trouble shooting. All work under Licensed Transport Pilots. Solo guaranteed in 10 hours. Advanced work, acrobatics, cross country, nite flying all after solo according to the course. You can pass the Departments flying and technical tests. You fly every day, no waiting for time, start the day you arrive. Write for full detail and outline of course.

KCFS

617 Grand Avenue, Kansas City, Missouri

*Nebraska*

## LINCOLN SCHOOL OF AVIATION

Expert and complete instruction in flying, mechanics, meteorology, rigging, etc. $250 for ten hour ground and flying course. $600 for fifty hour course. We qualify you for U. S. Gov. license. No bond for solo. "Get your instruction where Lindbergh trained." *Write for literature.*

2419 SOUTH ST., LINCOLN, NEBR.

*New Jersey*

**THE MILLER CORPORATION**
10 hour flying and ground school course Modern equipment. Experienced instructors. No liability bond required. *Write for details to* The Miller Corporation. New Brunswick Air Port, New Brunswick. N. J. Field two miles west of city on Lincoln Highway.

*New Jersey*

**Warren County Aviation Co. Inc.**
*Agent for Waco Airplanes*
For Warren, Hunderton, Sussex, Passaic counties in N. J. Northampton, Monroe counties in Penna. Student training on new Waco Airplanes. Rates and particulars on request. Phillipsburg, N. J. Phone 902.

*New York*

## AVIATION ENGINEERING SCHOOL

Tel. Stillwell 6010.
Queensboro Plaza Sta., L.I.C., N.Y.
Engineering and practical training in designing, construction and flying; actual work in building new planes; also in repairing, testing all types of engines. Oldest and largest school in the state.

*New York*

**CURTISS FLYING SERVICE, Inc.**
Clinton Road Garden City, N. Y.
In 1927 this Company flew more than 365,000 miles, carried 10,700 passengers, and graduated 224 flying students.
Air fleet of sixteen planes; equipment and personnel licensed by Department of Commerce. Phone Garden City 2508.
*Write for Flying School Booklet.*

*Ohio*

HANGAR AND SERVICE CLEVELAND AIRPORT BOULEVARD—1011

GENERAL OFFICES 2196 CLARKWOOD RD RANDOLPH — 6785

TAC

## *CLEVELAND*

PASSENGER SERVICE
STINSON AIRPLANE DISTRIBUTORS
HANGAR & REPAIR SERVICE
Also Aero-advertising and Photography—Sight-seeing Flights — Contract Work — Student Training, Stinson, Laird, Eaglerock, Swallow, Travel Air planes.

**Thompson Aeronautical Corp.**

*Ohio*

**LEARN TO FLY IN CINCINNATI**
Complete Flying Course in new Travel-Air Airplanes. . . . Expert instructors under direction of Major Hugh Watson. *Excellent lodgings near field. Write for complete details.*
**WATSON AIRPORT, Inc., Blue Ash, O.**
Exclusive Ohio Distributors for Travel-Air Planes.

*Ohio*

**Indian Lake Aviation Co., Russell Point, Ohio.** Learn to fly at Ohio's most popular summer resort in new Eaglerock ships, competent instructors, reasonable quarters, and ideal flying conditions. Actual flying time $20. per hr. take as many hours as you need. Training begins the day you arrive. No bond for solo as no accidents have occurred in 8 years.

*Ohio*

**The Superior Aircraft Co.**
**(Dealers Alexander Eaglerock)**
A thorough course in flying under competent instructors, on new Eaglerock planes. Course includes fundamental principles of Meteorology and Navigation. Information on request.
116 W. High St., Lima, Ohio.

*Ohio*

**Mansfield Aerial Service**
MANSFIELD, OHIO
*Student Training . . . Taxi Service*
$20.00 an hour or $175.00 for 10 hr. course, including ground work, preparatory to private license. Write for full information.
**Distributors of Lincoln-Page in Eastern Ohio**

# WHERE TO FLY

*Ohio*

**LEARN TO FLY**
RAVENROCK AIRPORT,
PORTSMOUTH, OHIO

Where you will have the advantage of having competent instructors with long experience. Flying instruction under the supervision of 'Pat' Love veteran flier.

Up to date equipment of 'Waco' and 'American Moth' planes.

We guarantee to teach you to fly—giving you at least ten hours in the air. No liability bond required for when we turn you loose we know you can fly. Complete course of flying and ground school $200.

After you have completed our course you can receive additional flying time through our club plan at a very nominal cost.

PORTSMOUTH AERO CORPORATION

*Pennsylvania*

**PITCAIRN AVIATION of PENNSYLVANIA, Inc.**

10-HOUR FLYING COURSE. 4-way flying field, at Willow Grove, Pa., the largest in the East, in midst of ideal flying country. All-year-round school. Modern flying equipment, including Pitcairn Orowings. Reasonable board and lodging near field. No liability bond required.

*Write for illustrated booklet.*

Land Title Building
PHILADELPHIA

A card in this directory . . . keeps your service constantly before the industry . . .

*Pennsylvania*

COMPLETE TRAINING

*Solo Practice* — *Employment Service*

Course includes theory, mechanics and flying. Full or spare time training. Licensed instructors. Modern equipment. Qualify for any license. Low cost. Special facilities for out-of-town members. Write.

UNITED FLYING CLUB, INC.
1011 Chestnut St. Philadelphia, Pa.

*Distributors* LINCOLN PAGE AIRPLANE
Dealers wanted in Pennsylvania and N. J.

*Texas*

**UNIVERSITY AERIAL SERVICE CO.**
**UNIVERSITY AIRPORT, Austin, Texas**
*State Distributors for*

WACO AIRPLANES

NEW PLANES, PARTS, ACCESSORIES, OX-5 AND HISSO MOTORS CARRIED IN STOCK

Complete Service and Repair Facilities

*AN ALL-YEAR-ROUND FLYING SCHOOL GRADUATING REAL COMMERCIAL PILOTS CONDUCTED by*

University School of Aeronautics
*Write us about your needs*

# INDEX TO ADVERTISERS


Advance Aircraft Co. ..... 1140
Aeronautical Engineering Company ..... 1182
Aerotech, Inc. ..... 1182
Air Associates, Inc. ..... 1183
Air Transport Equipment, Inc. ..... 1183
Aircraft Service Directory ..... 1182-1183-1184
American Eagle Aircraft Corp. ..... 1177
American School of Aviation ..... 1178
American Trading Co. ..... 1182
Arkansas Aircraft Co ..... 1187
Arthur & Co., William E. ..... 1176
Austin Co., The ..... 1171
Barbour Stockwell Company ..... 1182
Bendix Brake Co. ..... 1167
Black, Archibald ..... 1182
Bohn Aluminum & Brass Corp. ..... 1188
Braniff Co., The T. E. ..... 1178
Buhl Aircraft Co. ..... 1162
Classified Advertising ..... 1185
Cleveland Pneumatic Tool Co. ..... 1166
Consolidated Instrument Co. ..... 1177
Crawford Airplane Co. ..... 1183
Curtiss Aeroplane & Motor Co. ..... 1175
Edo Aircraft Co. ..... 1160
Embry-Riddle Co., Inc. ..... 1183
Fairchild Aviation Co. and Subsidiaries ..... 1139
G. & O. Mfg. Co. ..... 1177
General Electric Co. ..... 1161
Guggenheim School of Aeronautics, Daniel ..... 1183
Hamilton Aero Mfg. Co. ..... 1182
Hanson, C. S. ..... 1182
Hartzell Walnut Propeller Co. ..... 1176
Haskelite Mfg. Co. ..... 1184
Ihling Bros. Everard Co. ..... 1172
Johnson Co., The ..... 1183
Kerber, L. V. - Stalker, E. A. ..... 1184
Kreider-Reisner Aircraft Co. ..... 1183
Larkin Aircraft & Supply Co., Ltd. ..... 1174
Lawyers Corporation Company ..... 1182
Linde Air Products Company, The ..... 1138
Ludington Flying Service, Inc. ..... 1183
Mallette & Son, J. E. ..... 1173
Martin Co., The Glenn L. ..... 1141
Marshall Flying School ..... 1172
McBride & Co., Robert M. ..... 1163
Monumental Aircraft Co. ..... 1183
National Aeronautic Association ..... 1178
National Aviation Training ..... 1171
New York Aircraft Distributors, Inc. ..... 1183
Nicholas-Beazley Airplane Co., Inc. ..... 1169
Ohio Aero Mfg. Corp. ..... 1164
Paragon Engineers, Inc. ..... 1184
Perry-Austen Mfg. Co. ..... 1175
Phenix Aircraft Products Co. ..... 1183
Pioneer Instrument Co. ..... 1182
Polachek, Z. H. ..... 1183
Pratt & Whitney Aircraft Co. ..... 1159
Russell Mfg. Co. ..... 1183
San Diego, City of ..... 1175
Scintilla Magneto Co. ..... 1143
Service Steel Co. ..... 1174
Southland Jobbing House ..... 1168
Swallow Airplane Mfg. Co. ..... 1169
Titanine, Inc. ..... 1174
Travel Air Mfg. Co. ..... 1166
Van Schaack Bros. Chemical Works ..... 1172
Varney Aircraft Co. ..... 1182
Varney Airlines ..... 1142
Vimalert Co., Ltd. ..... 1183
Watson Airport, Inc. ..... 1184
Whaley & Co., Edward A. ..... 1173
Where to Fly ..... 1179-1180-1181
White Dental Mfg. Co., S. S. ..... 1167
Wies, Inc., Geo. A. ..... 1182
Wood Elastic Web. Co., J. W. ..... 1173
Wright Aeronautical Corp. ..... 1144
Yockey Aircraft Co. ..... 1184
Yancey, Capt. Lewis A. ..... 1165

# The Aircraft Service Directory

## WHERE TO PROCURE EQUIPMENT AND SERVICES


**See our Advertisement**

*Pages 984-985, April 16 Issue.*

**PIONEER INSTRUMENT COMPANY**

**754 LEXINGTON AVE. BROOKLYN NEW YORK**

**LEARN AVIATION**

FREE

Send for Free illustrated catalogue, describing our flying course. Our course in Applied Airplane Mechanics and our Home-Study Course in Aviation. We have right now an opportunity for a few of our students to earn their tuition. If interested write at once for details.

**VARNEY SCHOOL OF FLIGHT**

1817-1819 Main Street, Peoria, Illinois

*Air Transport Engineering*

Ask for Air Transport Leaflet

ARCHIBALD BLACK

Garden City, N. Y.

**STEARMAN—STINSON MONOCOUPE**

GEO. A. WIES, Inc.

*Hangar* Curtiss Field. — 12 *Juniper Ave* Mineola, N. Y.

CONSULTING ENGINEERS

*Airports - Airways - Aircraft*

SURVEY - CONSTRUCTION - EQUIPMENT - OPERATION

AERONAUTICAL ENGINEERING CO.

527 5th Avenue, New York — Murray Hill 4955

**RELIANCE TACHOMETERS**

*FOR DEPENDABLE SERVICE*

*Send for Booklet T7*

BARBOUR STOCKWELL COMPANY

Blanchard Instrument Dept.,

203 BROADWAY, CAMBRIDGE, MASS.

THE HAMILTON STANDARD PROPELLERS

THE AMERICAN EAGLE

*(Meets the approval of all Flyers)*

*QUALITY—PERFORMANCE—BEAUTY*

Demonstrations and Information Cheerfully Given—Write Today

Associate dealers wanted

C. S. HANSON

FIELD—R. D. No. 1, HUBBARD, OHIO

*— DISTRIBUTORS NORTHEASTERN OHIO —*

**AEROTECH Inc.**

Aeronautical Engineering Design,

Stress Analysis, Reports, Appraisals.

Complete Testing Facilities

1955 Sedgwick Ave., New York City — Moline, Ill.

**INCORPORATE YOUR FLYING SCHOOL, CLUB OR BUSINESS IN DELAWARE**

*Liberal charters—reasonable rates*

$100,000 corporation complete $73.00

500,000 " " 113.00

*24 Hour Service.*

LAWYERS CORPORATION COMPANY

Equitable Bldg., Wilmington, Del.

*South America*

**COLOMBIAN AIRWAY SYSTEM**

Saves 10 days from Seaports to Central and Western Colombia Air Mail, Parcelpost and Passengers on scheduled service connecting with United Fruit Steamers.

*For particulars inquire:*

**American Trading Co., Inc., 25 Broad St., New York City**

**PATENT YOUR IDEAS**

Send me a sketch or simple model of your invention. SATISFACTORY TERMS.

FREE { Confidential advice. Illustrated Literature

DO IT NOW!

**THE AIRCRAFT SERVICE DIRECTORY**

***Brings You Into Weekly Contact With***

**THE ENTIRE AERONAUTICAL INDUSTRY**

# The Aircraft Service Directory

## WHERE TO PROCURE EQUIPMENT AND SERVICES

**EVERYTHING FOR THE AIRPLANE**

*LARGEST AIRPLANE SUPPLY HOUSE IN THE WEST*
A complete line of parts and accessories for aircraft at lowest prices
A money-back guarantee on everything sold.
WRITE OR WIRE US YOUR REQUIREMENTS.
CRAWFORD AIRPLANE COMPANY
*"Masters of the Air."*
850 WASHINGTON BLVD. VENICE, CALIFORNIA

---

**Daniel Guggenheim School of Aeronautics**

Courses in Aeronautical Engineering and Industrial Aviation. For particulars apply to the Dean of the College of Engineering.

**N. Y. University, University Heights, New York, N. Y.**

---

*Eastern Distributors*
LOCKHEED "VEGA"
*Hangar: Curtiss Field, Long Island, N. Y.*
*City Office: 535 Fifth Ave., New York City*
AIR ASSOCIATES, Inc.

---

**LUDINGTON PHILADELPHIA FLYING SERVICE**
*Incorporated*
*OPERATORS PHILADELPHIA AIRPORT*
PASCHAL P. O., PHILADELPHIA, PA.
**FAIRCHILD** *Agents* **WACO**
Modern Flying Instruction Course Aerial Taxi Service
Field Completely Equipped for Day and Night Flying.
Machine and Woodworking Shops, Supplies and Modern Hangars
CITY OFFICE, ATLANTIC BLDG., PHILADELPHIA, PA.

---

**LIBERTY MOTORS** For Export & Domestic Use. For Airplanes & Boats. **LIBERTY PARTS**

**THE VIMALERT COMPANY, Ltd.**
807 Garfield Avenue Jersey City, N. J., U. S. A.

---

**AVIATION**

$4.00 a year — Canada $5.00
Foreign $6.00

---

WACO AIRPLANES

NEW YORK AIRCRAFT DISTRIBUTORS, INC.
New York Distributors
CURTISS FIELD, GARDEN CITY, N. Y.
GARDEN CITY 4560

---

**THE EMBRY-RIDDLE COMPANY, Inc.**
LUNKEN AIRPORT, CINCINNATI, OHIO
**WACO** *Distributors* **WACO**
Complete Line of Supplies on Hand
OX5 Motor Parts Complete Line
ALL BRANCHES COMMERCIAL AVIATION
WE *GUARANTEE* TO TEACH YOU TO FLY

---

**PHENIX NITRATE CLEAR DOPE**

at $1.35 per gal. in 50 gal. steel drums. Drums extra at $7.00 and full refund if returned in 90 days, freight prepaid. $1.42 per gal. in 50 gal. Wood Barrels. $1.45 per gal. in 30 gal. Wood Barrels. $1.60 per gal. in 5 gal. Boxed Cans.

WOOD BARRELS AND CANS INCLUDED AND NOT RETURNABLE.
*Immediate shipment f. o. b. Factory.*
*All fresh made from new and high grade materials.*
*No war stock or reworked materials.*
**Phenix Aircraft Products Co., Williamsville, N. Y.**

---

**AIRCRAFT SUPPLIES**

Recent additions to our stock of wide variety and large volume of standard and utility aircraft materials and motor parts now enables us to give you prompt and efficient service.

Send for 1927 Catalogue No. 5. Special quotations on quantity orders.

MONUMENTAL AIRCRAFT, INC.
339 N. St. Paul Terrace, Baltimore, Md.

---

*SEND FOR RATES*
*FOR THE AIRCRAFT SERVICE*
*DIRECTORY*

---

**Aviation Emblems**
**JOHNSON COMPANY**
*Originators of*
Emblems for Flying Schools—Clubs—Etc.
Souvenirs for Airport Openings—Passenger Flights
352 W. 13th St. Wing Building New York, N. Y.
*Write for Catalog P*

---

**KREIDER-REISNER AIRCRAFT CO., Inc.**

THREE PLACE OX5 Challenger
Approved Type Certificate No. 19

Berling Booster Parts . . $8.00
Battery & Coil Booster . $8.00

Sent Prepaid When Cash Is Mailed With Order.

*Hagerstown, Md., U.S.A.*

---

Cylinders Pistons Gaskets etc. **OXX6** Rings Crankcases Crankshafts etc.

*Brand New - Immediate Shipment*
**Air Transport Equipment, Inc., Carle Place, L.I., N.Y.**

## Aircraft Service Directory

Contractors to U. S. Government and Commercial Manufacturers

**HARTZELL PROPELLERS ARE RELIABLE**

BUILT ON HONOR — THEY ARE GIVING EFFICIENT SERVICE ON ALL CLASSES OF MILITARY AND COMMERCIAL AIRPLANES

*New OX Walnut Propellers for Quick Shipment*

**HARTZELL WALNUT PROPELLER CO.**
PIQUA, OHIO

**HASKELITE**
**PLYWOOD**

Used by every important builder. Recognized as the standard plywood for airplane construction. Over 30 applications. Blue print data book on request.

**HASKELITE MANUFACTURING CORPORATION**
120 S. LaSalle Street, Chicago, Illinois

**Airplane Business for Sale**

All planes, hangars, tools, equipment and assets of Yackey Aircraft Co., Maywood, Illinois.

*Place Your Product Before the Industry by Advertising in The Directory*

302 E. Eng. Bldg. Ann Arbor, Mich.

**CONSULTANTS in AIRPLANE DESIGN**

L V KERBER E. A. STALKER

**WATSON AIRPORT, INC., CINCINNATI, OHIO**
Exclusive OHIO DISTRIBUTOR for

**TRAVEL AIR**
AIRPLANES

Major Hugh Watson, President and Chief Pilot. Flying Field, Watson Airport, Blue Ash, 12 miles from Cincinnati.
*Learn to fly on a brand new Travel-Air*

**PARAGON PROPELLERS**

*Better than Ever*

The new MONOID Interlaced Fibre Propellers have substantially completed their period of trial and demonstration and will be put into quantity production very soon. Watch for them.

**PARAGON ENGINEERS INC.** Baltimore, Maryland



# AERONAUTIC SAFETY CODE

*A Compendium of the Results of Four Years' Study by Leading Engineers, and Government and Civilian Experts of the Aircraft Industry*

Sponsored by the U. S. Bureau of Standards and Society of Automotive Engineers, and Approved by the American Engineering Standards Committee, October, 1925.

*The Aeronautic Safety Code covers*

GOOD PRACTICE AND SAFE METHODS in the Design, Construction, Testing, Operation and Maintenance of Aircraft, Aircraft Engines and Accessories, Airdrome and Airway Equipment

*It includes*

**SENSIBLE RULES OF THE ROAD AND SAFETY PROVISIONS FOR FLYING AND GROUND PERSONNEL**

***Fifty-two Pages - Well Indexed***

AN ESSENTIAL REFERENCE GUIDE FOR THOSE WHO WISH TO BUILD UP PUBLIC CONFIDENCE IN AIR TRANSPORT.

**SINGLE COPIES $1.50**

**A year's subscription to AVIATION (52 issues, $4.00) and a copy of the Safety Code for $5.00.**

**AVIATION PUBLISHING CORP.**
**250 W 57 St., New York**

***Use the Coupon***

AVIATION PUBLISHING CORP.
250 W 57 St.,
New York.

Check (X) in Square

☐ Enter my subscription to AVIATION and mail me a copy of the AERONAUTIC SAFETY Code. Five dollars to cover is enclosed.

☐ Mail to address below — copy or copies of the AERONAUTIC SAFETY CODE, AT $1.50 each, for which I enclose $

(Name) .....

(Address) .....

# CLASSIFIED ADVERTISING

**10 cents a word, minimum charge $2.50, payable in advance. 15 cents a word if box number is used. Address replies to box numbers, care AVIATION, 250 W 57th St., New York.**

ATTENTION AVIATORS: Graphite valve guides threaded into OX and OXX cylinders. Removable valve seats installed. Graphite piston rings. Prices and descriptive literature upon request. Ill. Flying Co., 507 Locust St., Sterling, Ill.

IMMEDIATE SALE: Nieuport biplane, wings, tail group, fittings complete. New Gnome 165 hp., complete motor, tachometer, prop., instruments. Entire lot crated $200.00. Loyd Pepple, Queensborough, Shreveport, La.

FOR SALE: Hisso motor, 180 hp., like new; all kinds spare parts, $650.00. A. Ghio, P.O. Box 1205, San Diego, Calif.

CURTISS-REED pusher propeller, M-20, 8 ft., diameter x 6 ft., pitch, perfect condition. Price $140.00. Curran, 159 Newtown Rd., Long Island City, N. Y.

FOUR USED Hisso motors, two 150 hp., and two 180 hp., for sale. Best cash bidder gets lot or will take $400.00 cash for each one. Will trade for good used Waco, Eaglerock or Travel Air. All in excellent condition; just overhauled. Ben J. Clift, Soddy, Tenn.

WILL SELL my share (50%) in three-place OX-5 ship; 38 ft., wing spread; split type landing gear for $350.00. Box 861, AVIATION.

FOR SALE: Large modern house and best airport site in large radius. Thousand foot runways with possible 1500 foot diagonal. Adjoining land suitable for expansion. One ship steel hangar on field. Located 3 miles from center of Connecticut manufacturing city. Ideal for commercial development, sport use or the establishment of an inn for overnight stops. Only 22 miles from Hartford. Box 862, AVIATION.

FOR SALE: Three-place Pheasant biplane; almost brand new; only 7 hours flying time; dual equipped; a fine performer. Less motor $1500.00. Ross Becker, 901 Elizabeth St., Jackson, Mich.

TWO OVERHAULED C-6 motors with Bijur starters and new spare parts for $750.00 each. New Orleans Air Line, New Orleans, La.

SHORT WING OX-5 Standard, good flying condition; motor turns 1400, $750.00. Good student ship. A. Sergeson, Pine Valley Flying Field, Clementon, N. J.

FOR SALE: Waco 9, fine condition; motor turns 1400. For quick sale best cash offer takes it. Wire or write H. M. Crader, Towanda, Pa.

HAVE 14 OX-5's same as new. All can be used in new ships. Closest inspection invited. $8,000.00 for all or $600.00 separately. Huge complete stock OX-5 parts, Hisso parts. Hewes Motor Co., Waukegan, Ill.

28 HP. LAWRANCE AND pusher prop. $75.00, less coil and battery. Starts on first pull on contact. Write Joe Edeskuty, Jr., 1727—11th Ave., So., Minneapolis, Minn.

FOR SALE or trade for good roadster my 4 place Whit-Lewis plane with 160 hp., Isotta motor—nose radiator. Ken Kugler, 249 Harrison St., Passaic, N. J.

JUST OUT—Book and blue prints on design, construction and operation of small sport plane. Contains lessons in flying also. All for $1.00 postpaid. Chas. E. Russell, 545 Stadium Place, Ft. Wayne, Ind.

FOR SALE: Bristol Cherub; smoothest running and most reliable sport plane motor ever built; 36 hp.; weighs 94 lbs., like new in every respect; complete with propeller, etc. Cost $1300.00. Bargain C. E. Lindstedt, 6428 N. Hermitage, Chicago, Ill.

FOR SALE: 3 place biplane in A-1 shape used 15 hours; price $1500.00. Also 4 Thomas Morse upper wings and center section with fittings, wires and struts or just wings, price $150.00 complete or $100.00 for wings in A-1 shape. Everything f.o.b., Athens, Ga., Apply Armel's Garage, Athens, Ga.

FOR SALE: Crashed new Waco 10, without motor, $375.00, with motor, $750.00. For sale also Jenny with Canuck wings, upper and lower ailerons with OXX-6 motor like new, $875.00. Ship now used for passenger hops; can carry two passengers. Very good condition. Must be seen to appreciate. Will buy late model three-place ship. A. F. Mokher, Ellenton, Florida.

FIRST OVERHAUL OXX-6 motor $375.00; overhauled OX-5 $300.00; toothpick propeller $22.00; new OX-5 Zenith carburetor $35.00; fine OXX-6 clipped wing Standard $700.00. Quincy Airplane Co., 126½ N. 5th St., Quincy, Ill. R. W. Schrock, Mgr.

FOR SALE: Eastman K-5 aerial camera with venturi and all equipment. $500.00. Box 859, AVIATION.

LICENSED MECHANIC and rigger wants position with responsible parties in United States or foreign country. Have complete shop equipment for care of any ship. Any reasonable offer accepted. Box 860, AVIATION.

WANTED: A FLYING position by one who has had 50 hours solo experience. For information inquire M. Streuer, Hinckley, Ill.

TRANSPORT LICENSED pilot, 400 hours, single, age 22, desires permanent position with reliable company or private owner. Will do anything that is a paying business. References furnished. Louie Roepke, Waterville, Kans.

LICENSED AIRPLANE and engine mechanic desires permanent position, company or private party; can instruct ground work or flight theory. Baker, P.O. Box 485, Albany, N. Y.

WANTED: THREE-place plane, good condition. Have $900.00 cash. What proposition can you offer? Henry Fieldhausen, 1814 Weeks Ave., Bronx, New York City.

WANTED: PAIR of Buhl Airster wings or would sell cracked ship, damaged three tail bays of fuselage and motor mount, or would take other OX job with or without motor and pay difference. Little, Cornwall, N. Y.

WANTED: NEW or used 220 Hisso priced right. New or used underslung cross-flow radiator for 180 hp. Hisso. Address Raymond Kinney, 173 Forest Ave., Fond du Lac, Wis.

WANTED: THREE-place OX-5 new production ship in good condition, less motor. Also wrecked American Eagle, Waco, Travel Air or Swallow in any condition; with or without motor. Stanley G. Fuller, Milford, Iowa.

WANTED: Used OX-5 motors or parts. Also OX-5 crank cases and OXX-6 crank cases. Box 782, AVIATION.

WANTED: NEW uncovered right lower wing for J-1 Standard. Hewes Motor Co., Waukegan, Ill.

WANTED: LIGHT air-cooled motor, 40 to 80 hp. Must be cheap, complete, in A-1 running condition. State best price. Elmer Crozier, Birmingham, Ala.

WANTED 5c each for your old intake rocker arm H's, if not cracked or bushed; 10c each for inlet water pipes if 4 pack nuts are OK. Will give rebuilt complete valve action exchange your old ones at $4.50 each. Hewes Motor Co., Waukegan, Ill.

HAVE CASH for Jenny in good shape. Also need used new production job. If you have either write giving full details. June Craig, Sandy Lake, Pa.

TRANSPORT PILOTS wanted: Answer stating reference etc. Write to C. S. Hanson, Hubbard, Ohio. Distributor of American Eagle airplanes.

WILL TRADE 26 Pontiac coach, first class shape and have some cash for good OX-5 ship what have you? C. H. Inmann, 409 N. Iuka St., Pratt, Kans.

OPPORTUNITY: STUDENTS can learn to fly by this special offer for $100.00 for a limited time. Two good Jennies for sale, also one new Hisso Model A. Joe Lewis, Municipal Airport, Long Beach, Calif.

HAVE LATE 25 Buick master coach, good condition; some cash for good ship; prefer Canuck or Standard. What have you? Preferably near Atlantic City. H. S. Fleming, 112 Pierson Ave., Somers Point, N. J.

WANTED: ANZANI air-cooled aircraft engine, 6 cylinder, 80 hp., either old or new type. Write G. Elias & Bro. Inc., Buffalo, N. Y. Give full description and price.

FOR SALE: Used Hisso Jenny, DH wheels, aluminum streamlines, 55 gallon gas tanks. Ship in good condition (never been cracked). Ideal cross country ship. A. W. Martin, LaFayette Hotel, Little Rock, Ark.

WANTED: PILOT to fly almost new Eaglerock fifty-fifty basis. Must have good record. Believe real money for right party. Walter R. Elmore, Bladenboro, N. C.

FOR SALE: Aeromarine landplane new, remodeled, latest improvements, absolutely complete and perfect; less motor $750.00 with Hisso "A" $1250.00 with OX-5 $1,000.00 crated, also one overhauled OX-5 motor $275.00, one Hisso model "A" rebuild, like new and perfect $450.00. Box 863, AVIATION.

LONG WING Eaglerock, split type landing gear, motor and ship in perfect condition, had less than 100 hours time, $2200.00. Wire Paul Braniff, Braniff Bldg., Oklahoma City, Okla.

POSITION WANTED. Young man with 10 years experience in building construction desires connection with individual or aircraft company. Full particulars on inquiry. Box 864, AVIATION.

# Keeping Pace . . . with an Industry that Flies

KEEPING pace with an industry that flies is impossible without a means of obtaining reliable and timely news of events in the industry—complete authoritative information on technical developments, new planes, engines and equipment—facts about modern production methods, merchandising procedure, operating practice, etc., as well as accounts of other aeronautical developments of importance. A good aeronautical publication should be the means for obtaining the above.

* * *

AVIATION is a weekly magazine which was originally established in 1916 and which since that date has been devoted entirely to the advancement of civil, commercial, and military aeronautics. Instead of stressing the romantic and spectacular in flying, AVIATION has always endeavored to print authentic, instructive and timely information so that its readers, which for the most part are those directly engaged in the industry, may keep themselves well informed on developments in that field. AVIATION is edited by experienced fliers who also possess a knowledge of publication practice and business in general. Each department is in charge of a man well qualified in his particular line. AVIATION has a larger editorial staff than any other aeronautical magazine and in addition spends more in payment for feature articles than any other publication, as expense is not spared in gathering editorial material. The advantage of weekly issues in a rapidly moving industry is self-evident.

## *News*

AVIATION as a weekly can present news while it *is* news. A nation-wide organization gathers information which is checked and edited by a special news editor. AVIATION news is reliable and complete. It gives the aviation slant to national news events. A whole section is devoted to the local news of the leading airports.

## *Technical Articles*

IMPORTANT technical articles are contributed by prominent authorities or are written by a technical editor, who is a graduate of a leading aeronautical engineering school. Material is gathered from many sources, both foreign and domestic, and covers the latest developments in aerodynamics, aircraft structures, airplane and engine design, navigation, meteorology, night flying, etc.

AVIATION is in a most favorable position to procure valuable technical articles because of the intimate contact it has had with the entire field of aeronautics during twelve years of continuous publication.

## *New Planes, Engines and Equipment*

DETAILED and reliable information on new planes, engines, accessories, and equipment is published in AVIATION weekly. It is possible to describe practically every new product in detail, because AVIATION carries during the course of a month as much editorial material as the three largest monthly aeronautical publications combined.

## *Statistics and Specifications*

AVIATION was the pioneer in the gathering and publishing of statistics on the aeronautical industry. It leads in this field at the present time and publishes much valuable statistical data, including figures on aircraft and engine production, exports, etc. Most of this is original material collected by the organization.

A table of specifications on American commercial airplanes and seaplanes is published in the first issue of each month. It presents, in easily comparable form, dimensions, performance data, constructional information, equipment, etc. A similar table for American aircraft engines is published once each month.

## *Production Methods, Merchandising and Operation*

AVIATION specializes in articles which will help those professionally engaged in aeronautics to produce more efficiently, market more successfully, or operate more economically, as the case may be. It is the business paper of the aeronautical industry. Articles are published regularly on improved production methods and practices; on the merchandising of aircraft, engines, accessories and the selling of commercial aviation services; and on the various phases of operation, such as airlines, commercial aviation service, schools and airports.

## *Departments*

THE EDITORIAL pages of AVIATION carry constructive discussions and views that result from an intimate contact with and thorough understanding of the problems of the aeronautical industry. Other departments are: *Foreign Aeronautical News, Book Reviews, Airports and Airways.* In this latter department there is included local airport news, lists of planes sold by local dealers, students enrolled by flying schools, etc. There is also a section devoted to news of the U. S. Air Services. Last but not least comes Robert R. Osborn's *Side Slips* column with its inimitable comments.

## *Buyers Service*

(*Advertising*)

THE ADVERTISING pages of AVIATION are a valuable and interesting source of aeronautical information. In these pages the leaders of the aeronautical industry describe their products and announce their latest developments. If you are contemplating taking a flight, learning to fly, purchasing a plane or any sort of aeronautical material, you will find the advertising pages of AVIATION invaluable.

* * *

IF YOU can use complete and authoritative information about what is going on in the aeronautical industry to advantage (and who cannot profitably use more knowledge about their particular line of work) you will be interested in receiving AVIATION regularly. At twenty cents a copy the 52 issues published during a year cost more than $10.00 and you run the risk of missing quite a few issues. However, a subscription for a year (52 numbers) costs only $4.00. The coupon below is for your convenience.

AVIATION

*Oldest American Aeronautical Magazine*

AVIATION PUBLISHING CORPORATION
250 WEST 57TH STREET, NEW YORK CITY

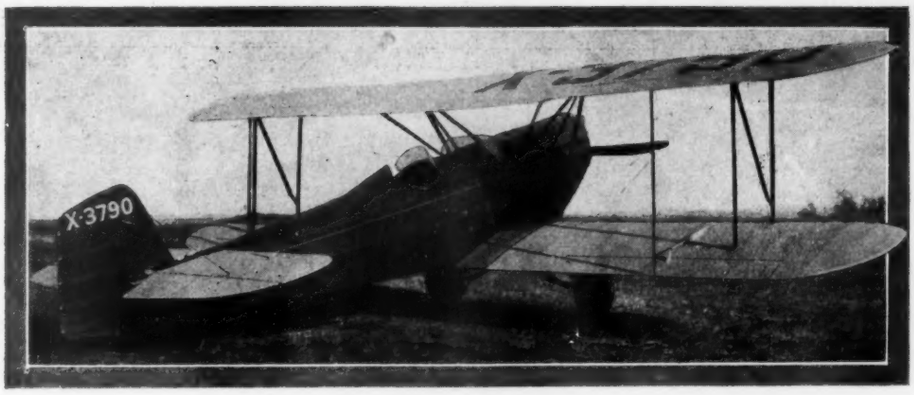
Please send me AVIATION for one year (52 issues), starting with the earliest possible issue. Subscription price: one year, $4.00 (Canada, $5.00; Foreign, $6.00). Check (or money order) is enclosed.

Name .....

Address .....

.....

Nature of your work .....
*Classification of readers by occupation desired*




# THE COMMAND-AIRE

The COMMAND-AIRE was designed and built in the belief there were a large number of people anxious for a plane that could truly be classified as "A Better Ship". The volume of orders received for the COMMAND-AIRE has more than justified this belief.

## Features That Make The "COMMAND-AIRE" the Greatest Airplane Value Ever Offered at the Present Price

1. Performance unexcelled by any other plane equipped with OX-5 motor.
2. Nose radiator, utilizing otherwise parasite resistance.
3. Improved split axle type landing gear with large wheels.
4. Fire wall of aluminum sheets with asbestos sheet between.
5. Metal floorboards, lighter than wood and fireproof.
6. Genuine Chase upholstering.
7. Extra large and comfortable cockpits.
8. All metal parts such as tubing, struts and fittings of chrome molybdenum steel.
9. Consolidated instruments mounted under plate glass and indirectly lighted as on finer automobiles.
10. Navigation lights connected ready for use.
11. Radiator shutters operated from pilot's cockpit for winter flying.
12. Stabilizer adjustable from pilot's cockpit.
13. Macwhyte streamline wires.
14. Plywood leading edges on wings.
15. Increased visibility through elimination of center section wires and braces.
16. Satin like finish through use of best fabrics and Berryloid lacquer.

**Price $2950**
**AT LITTLE ROCK**
*(Subject to change)*

If you expect to own a COMMAND-AIRE this season, your order should be placed without delay.

## To Dealers

On account of increased production, we are in position to contract with a few more reputable dealers — wire for details.

**ARKANSAS AIRCRAFT CO.**
**LITTLE ROCK, ARKANSAS**

# A Factor in All-American Aircraft Achievements

IN all the recent successes which have brought such lustre to American Aviation, Bohn Ring True Bearings have played a part.

The dependability of aircraft motors in the Air Mail Service and commercial aviation, as well as in the Army and Navy, is aided in no small measure by Bohn Ring True Bearings.

In fact, in the aircraft field, every recognized aircraft motor manufacturer has standardized on Bohn Ring True Bearings.

Bohnalite castings are more and more being used in aeroplane motor construction.

Bohn products are being used by such outstanding aircraft motor builders as:

*Curtiss Aeroplane & Motor Company, Inc.*
*Fairchild Caminez Engine Corp.*
*Packard Motor Car Co., Aircraft Division*
*Pratt & Whitney Aircraft Company*
*Wright Aeronautical Corporation*
*Warner Aircraft Corporation*

Such endorsements, we believe you will agree, can only be won by sheer merit.

## Bohn Aluminum & Brass Corporation

**Detroit, Michigan**

**BOHNALITE**